

Fig. 1

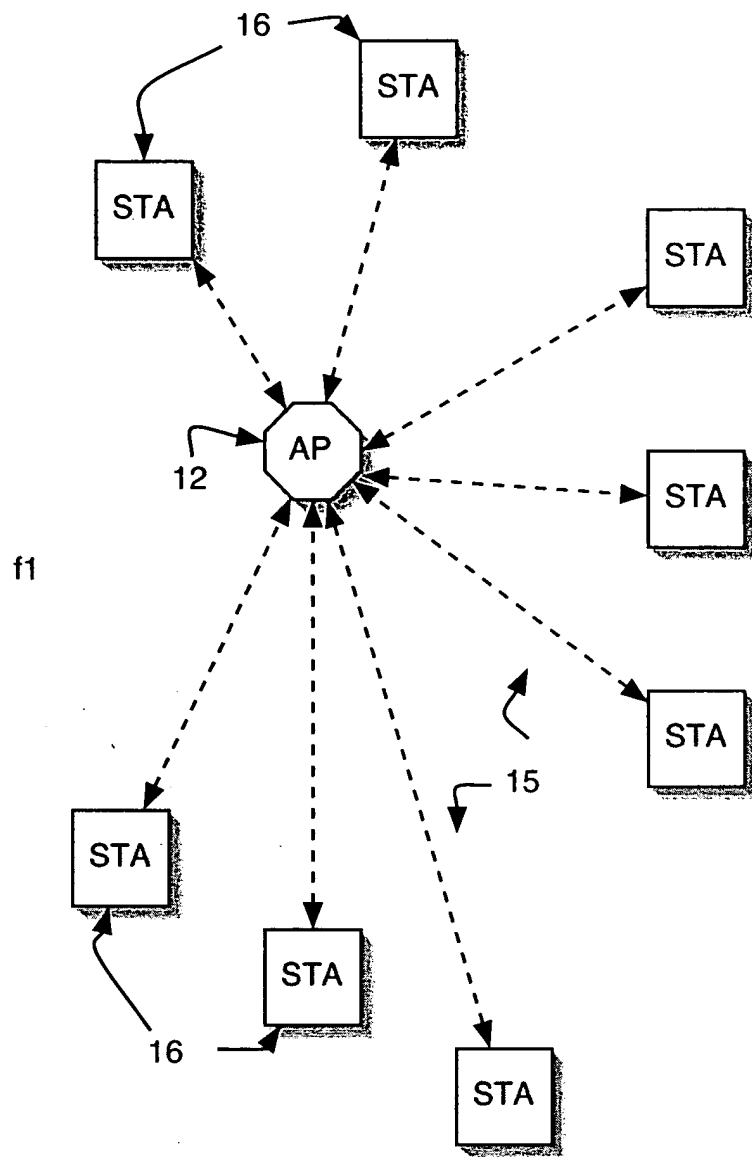


Fig. 2

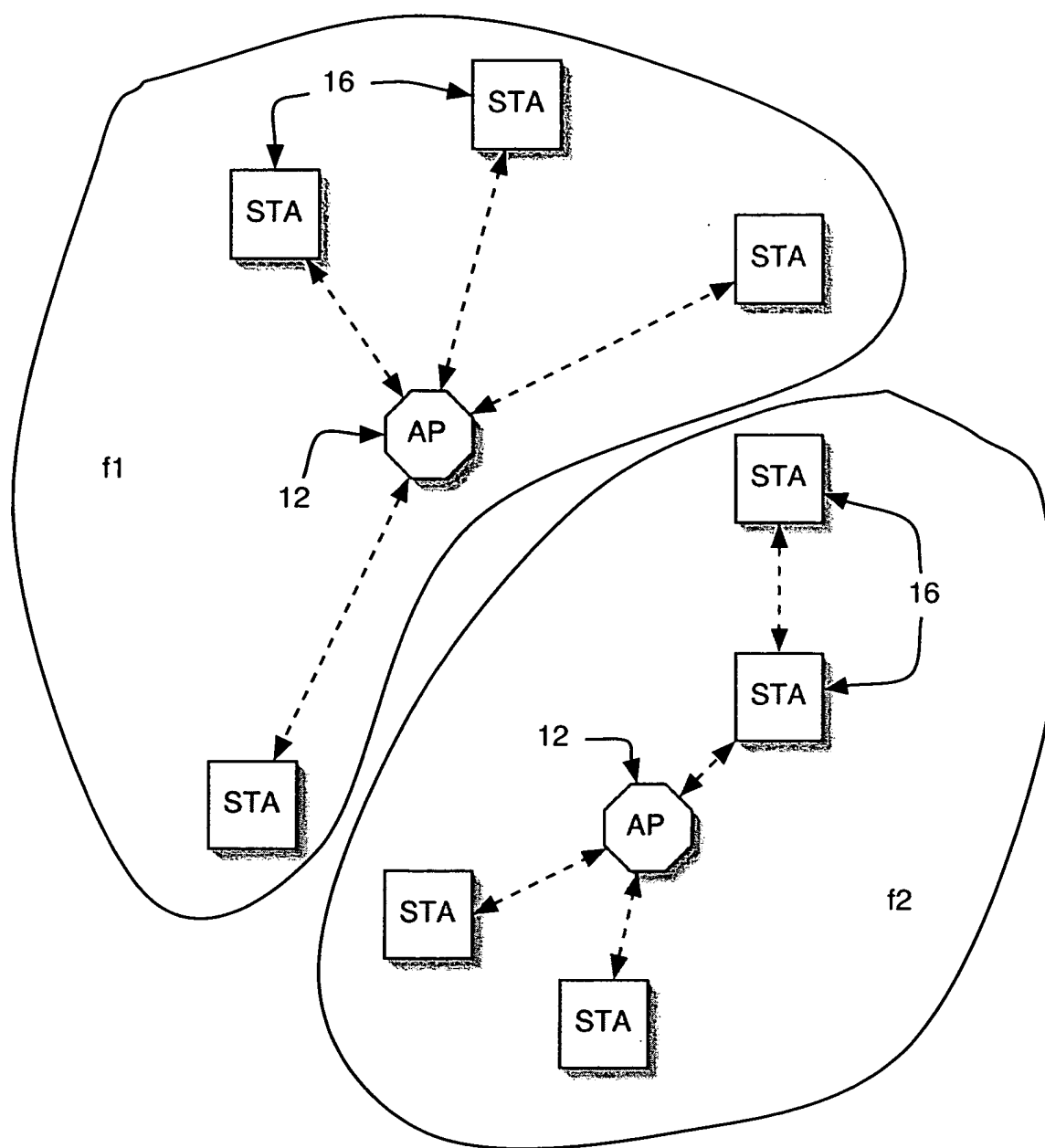


Fig. 3

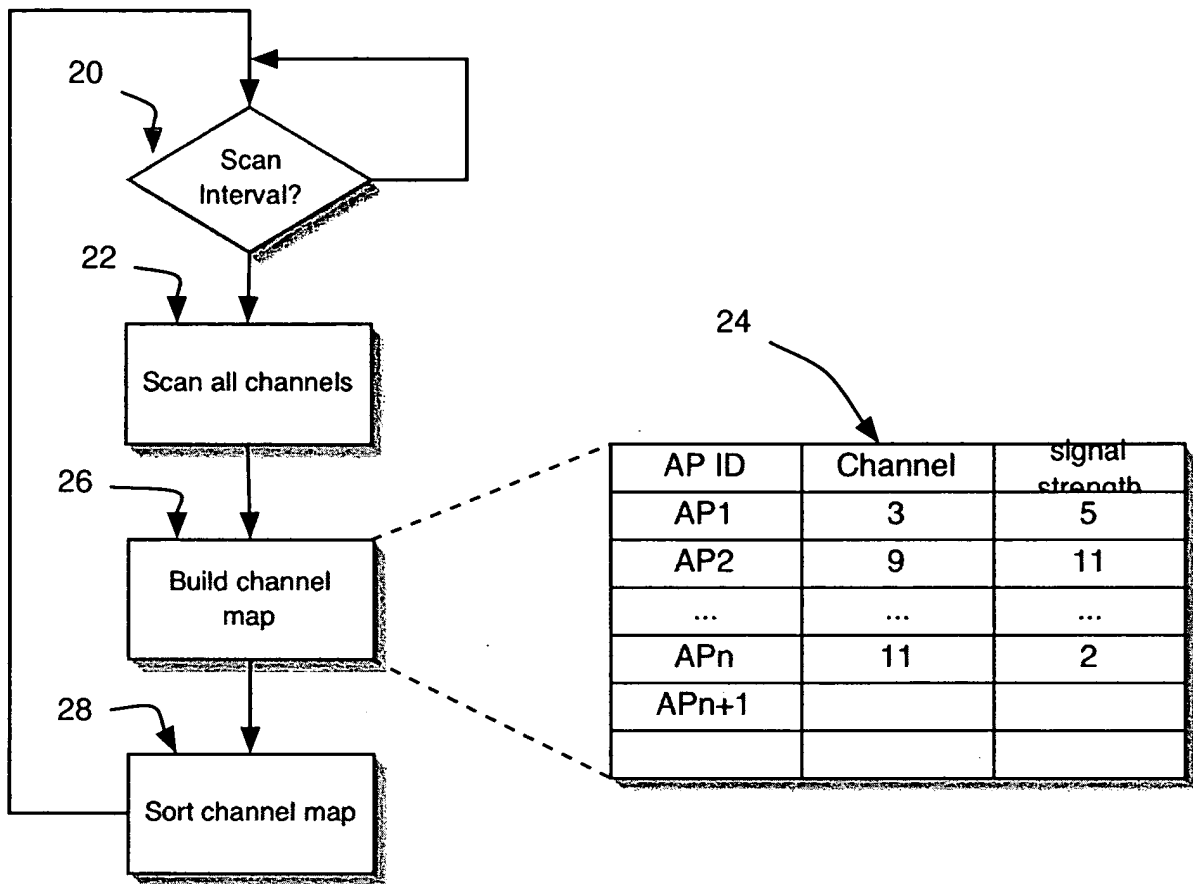


Fig. 4

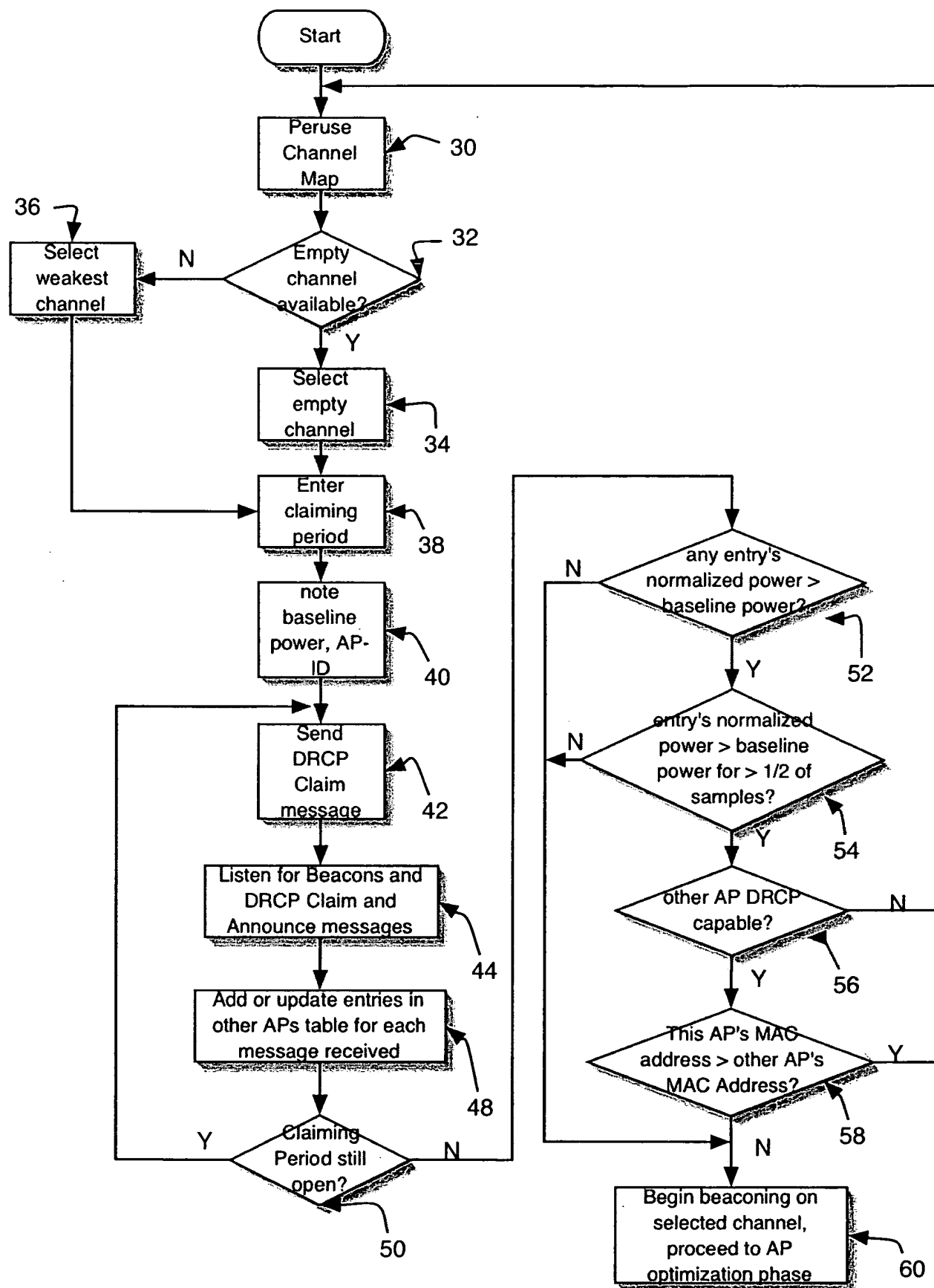


Fig. 5

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| AP_ID | received power | TP Backoff | DRCP | Normalized<br>received power |
|-------|----------------|------------|------|------------------------------|
| AP[1] | <list>         | <list>     | 1    |                              |
| AP[2] | 0              | ?          | 0    |                              |
| ...   | ...            | ...        | ...  | ...                          |
| AP[n] | <list>         | <list>     | 1    |                              |

Other APs Table

Fig. 6

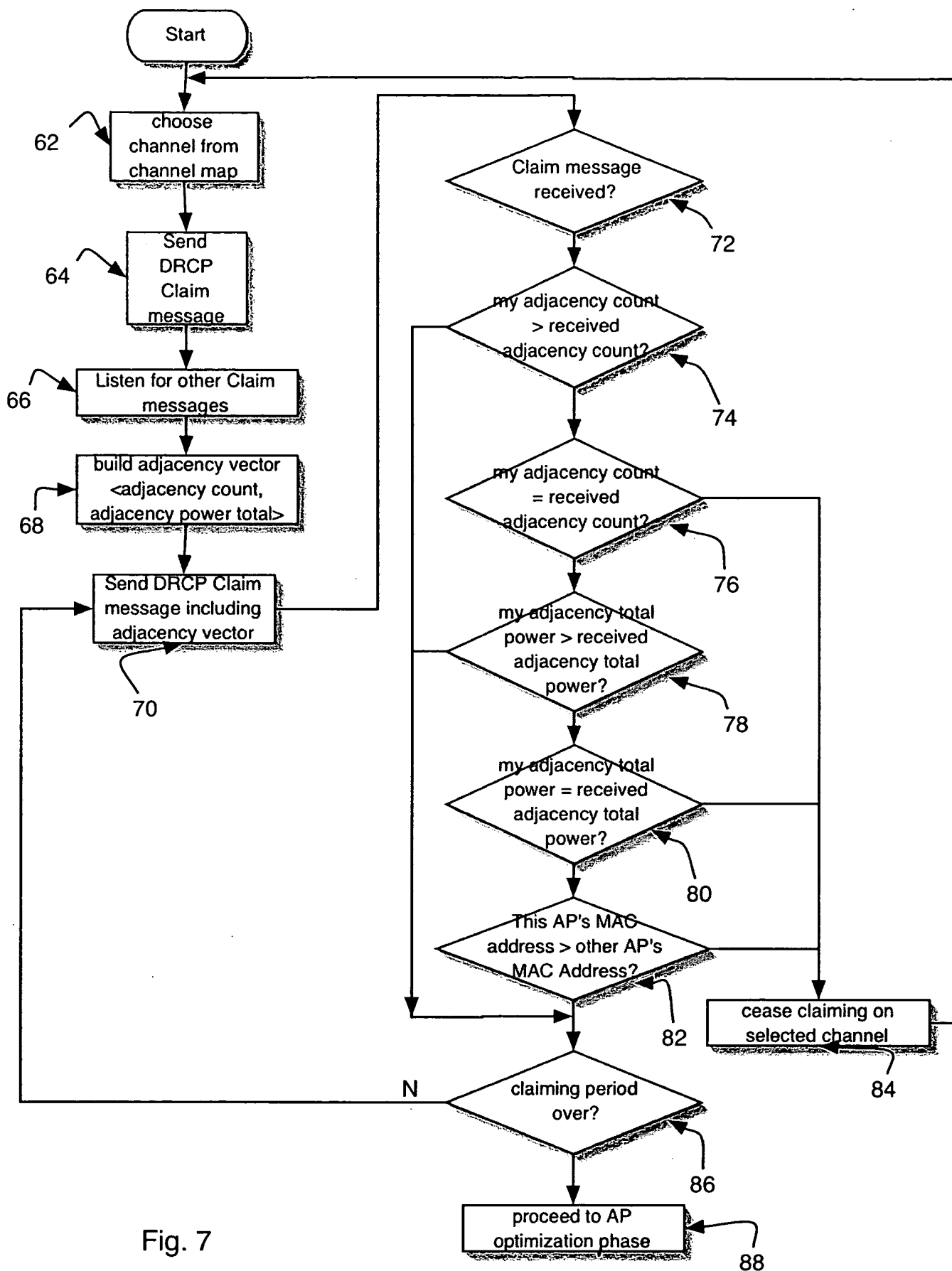


Fig. 7

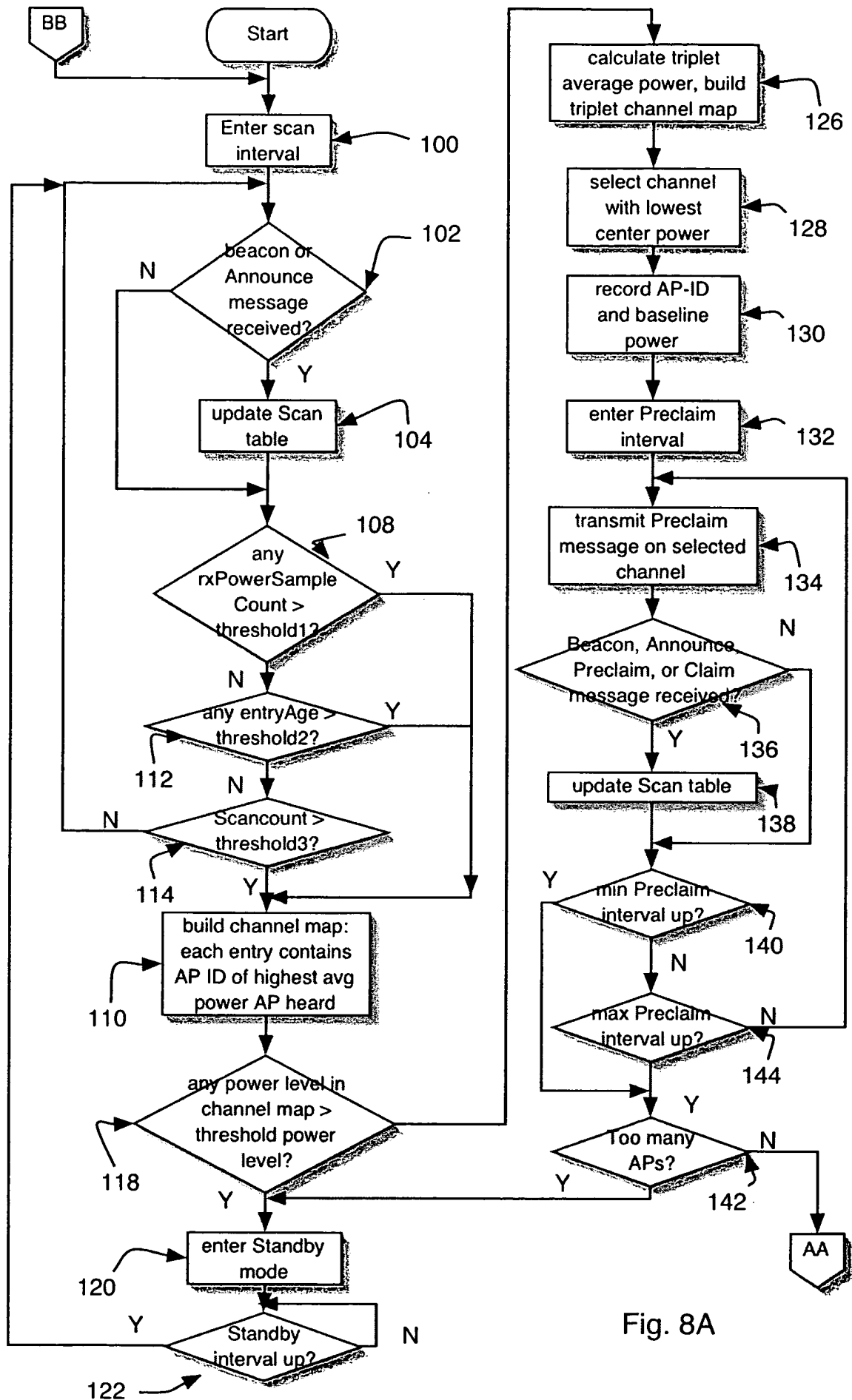
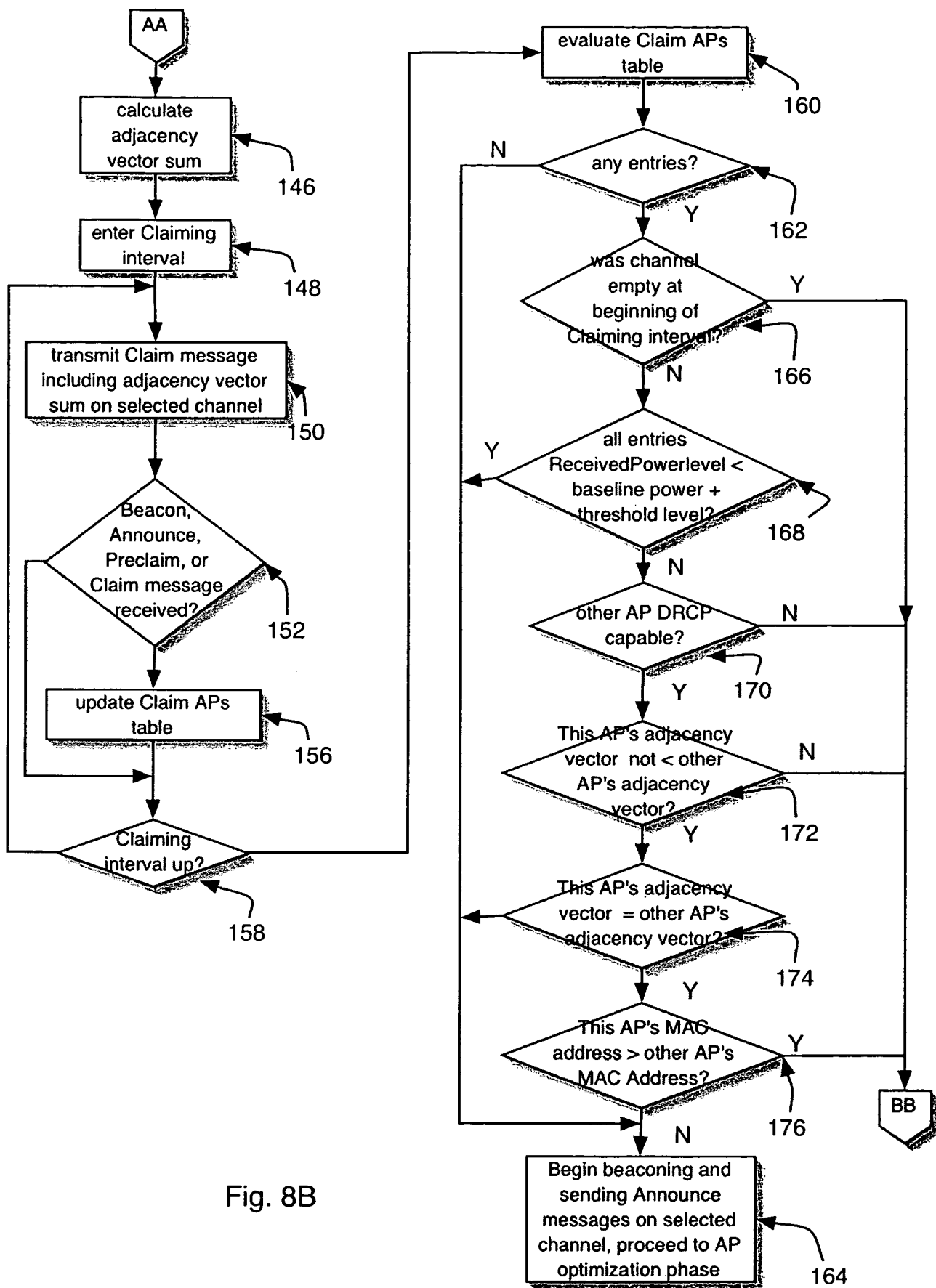



Fig. 8A





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| AP_ID | Channel_ID | rxPowerRunning<br>Total | rxPowerSample<br>Count | rxPowerAvg | DRCP | Age |
|-------|------------|-------------------------|------------------------|------------|------|-----|
| AP[1] | 3          | dbm                     | 3                      | dbm        | 1    | 3   |
| AP[2] | 3          | dbm                     | 5                      | dbm        | 0    | 7   |
| ...   | ...        | dbm                     | ...                    | ...        | ...  | ... |
| AP[n] | 5          | dbm                     | 8                      | dbm        | 1    | 4   |

Scan Table

Fig. 9

116

| Channel_<br>ID | highestPwr<br>AP_ID | highestPwrlevel |
|----------------|---------------------|-----------------|
| 2              | AP[1]               | dbm             |
| 3              | AP[2]               | dbm             |
| ...            | ...                 | ...             |
| 8              | AP[n]               | dbm             |

Channel Map

Fig. 10

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| Channel | signal strength | Triplet avg | AP ID |
|---------|-----------------|-------------|-------|
| 2       | 5               | 5           | 3     |
| 3       | 2               | 5           | 11    |
| 4       | 8               | 5           | 2     |
| 1       | 3               | 6           | 8     |
| 2       | 9               | 6           | 6     |
| 3       | 6               | 6           | 1     |
|         |                 |             |       |

Triplet channel map

Fig. 11

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| AP-ID | ReceivedPowerlevel | DRCP |
|-------|--------------------|------|
| 2     | <list>             | 5    |
| 3     | <list>             | 7    |
| 4     | <list>             | 3    |
| 7     | <list>             | 6    |
| 9     | <list>             | 9    |
| 11    | <list>             | 12   |

Claim APs table

Fig. 12

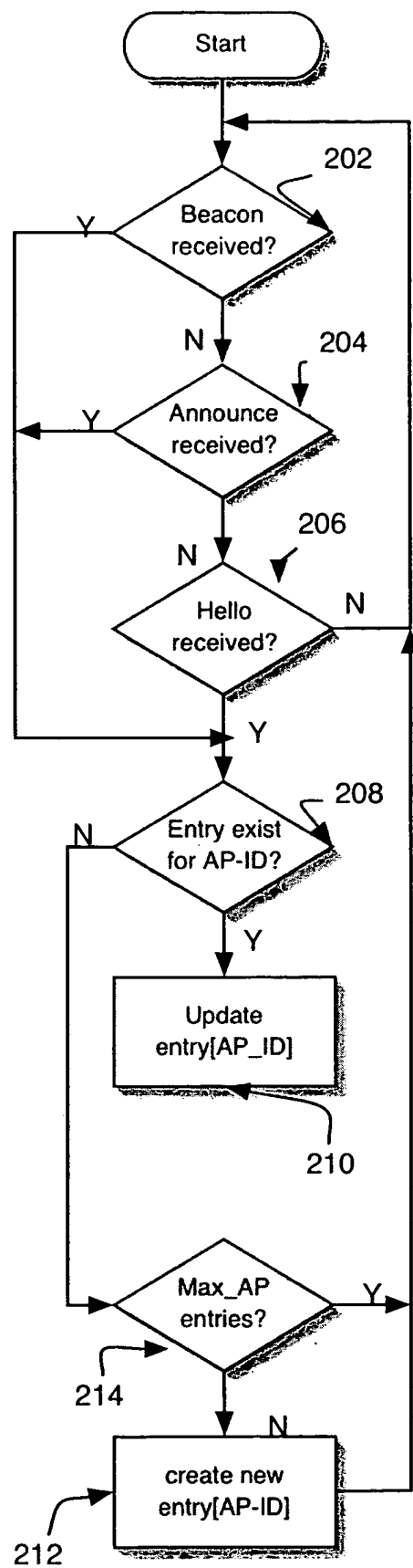



Fig. 13

200



| AP_ID      | TP_Backoff | Max Power | DRCP | Age | Normalized power | sample size | corrected power |
|------------|------------|-----------|------|-----|------------------|-------------|-----------------|
| AP[1]      | <list>     | <list>    | 1    | 2   | dbm              | 3           | dbm             |
| AP[2]      | 0          | max power | 0    | 3   | dbm              | 4           | dbm             |
| ...        | ...        | ...       | ...  | ... | ...              | ...         | ...             |
| AP[MAX_AP] | <list>     | <list>    | 1    | 1   | dbm              | 1           | dbm             |

AP Known APs Table

Fig. 14

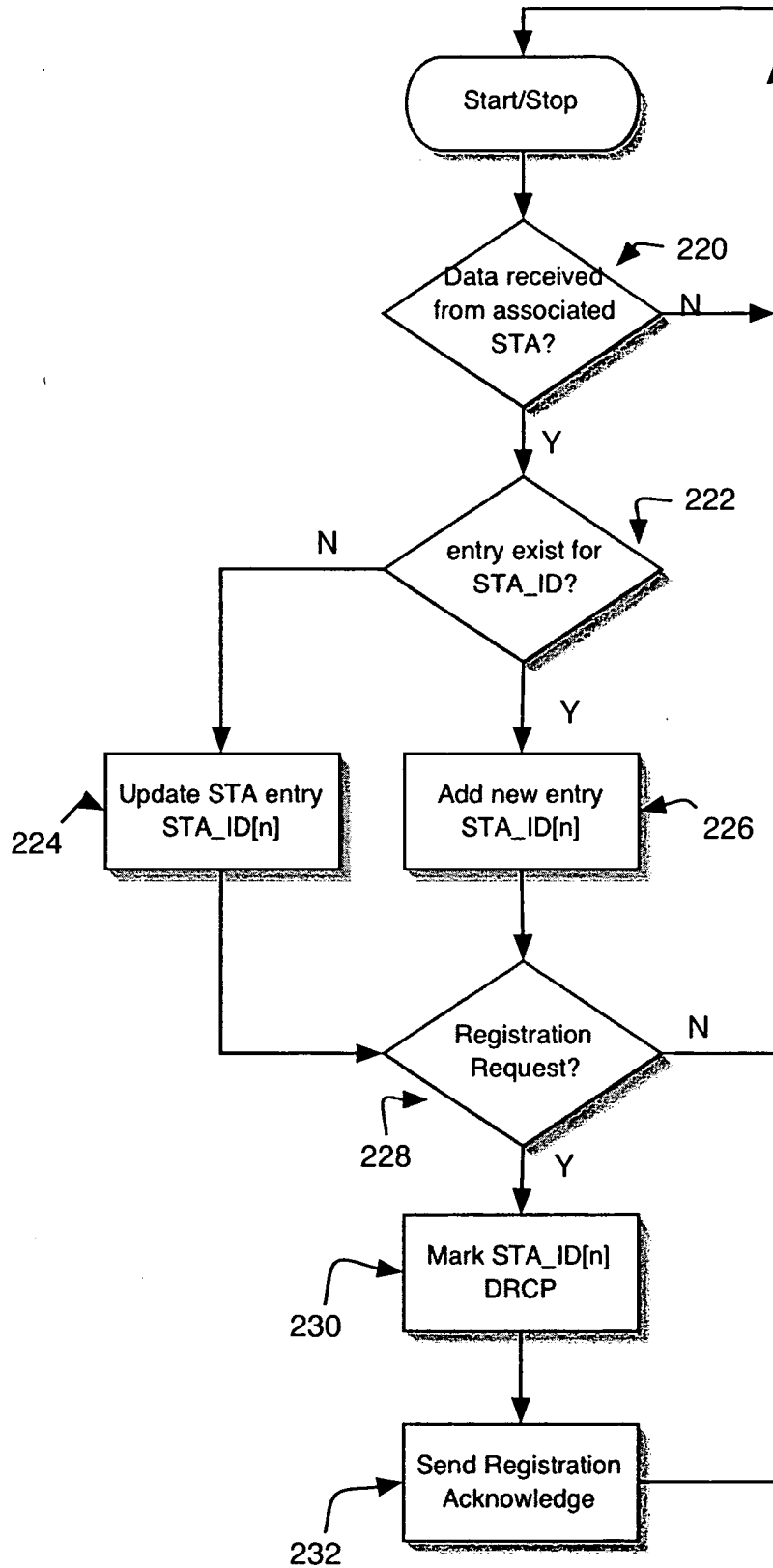



Fig. 15



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| STA_ID | Quiet-time | DRCP-Active | Distance | max power | sta_load_factor | power samples | normalized_power | corrected_power |
|--------|------------|-------------|----------|-----------|-----------------|---------------|------------------|-----------------|
| STA[1] | 4          | 1           | 1        | 1         | 2               | 1             | 1                | 1               |
| STA[2] | 0          | 0           | 0        | 0         | 3               | 0             | 0                | 0               |
| ...    | ...        | ...         | ...      | ...       | ...             | ...           | ...              | ...             |
| STA[n] | 6          | 1           | 3        | 1         | 1               | 1             | 1                | 1               |

AP Associated STA Table

Fig. 16

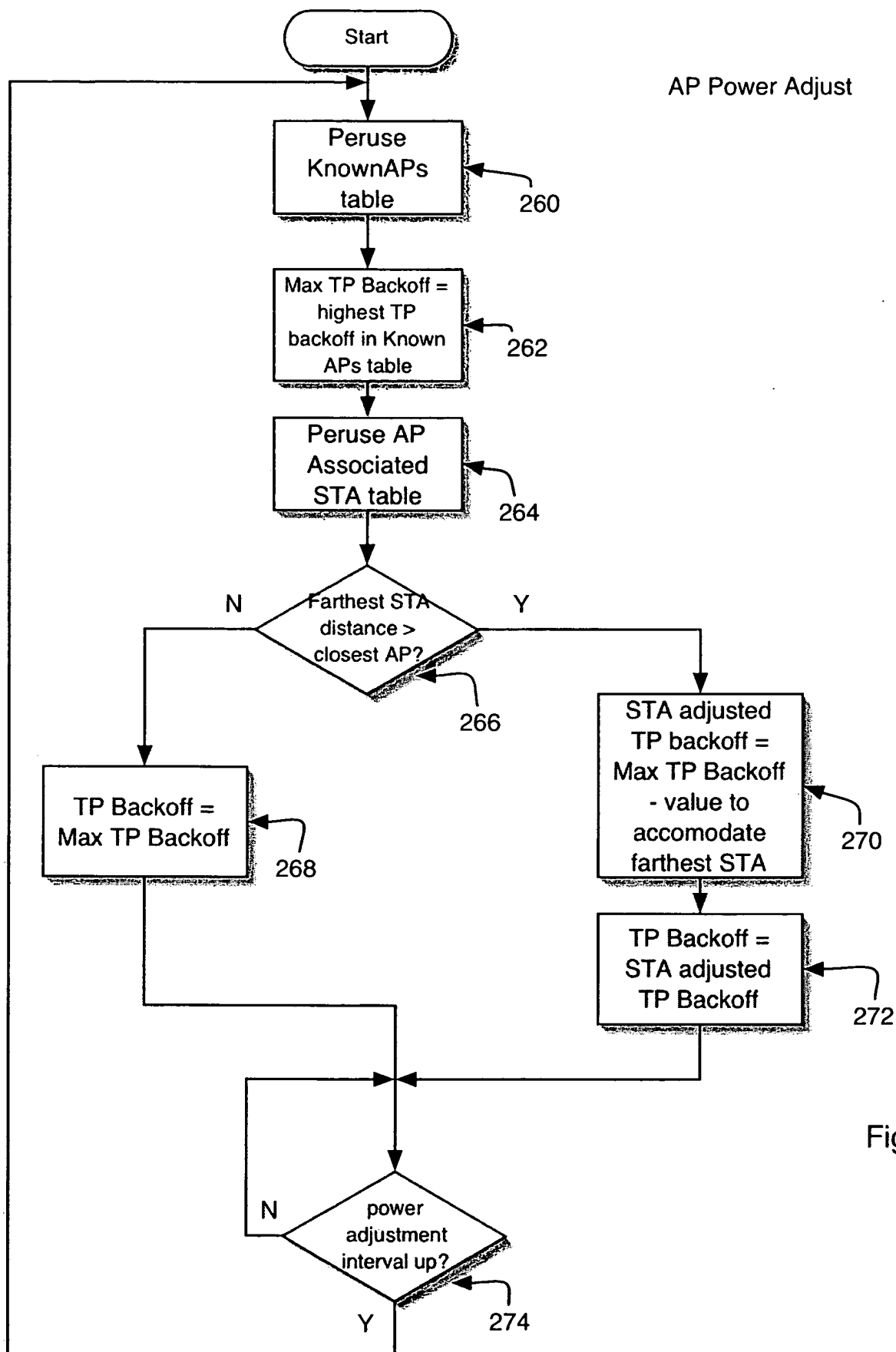


Fig. 17

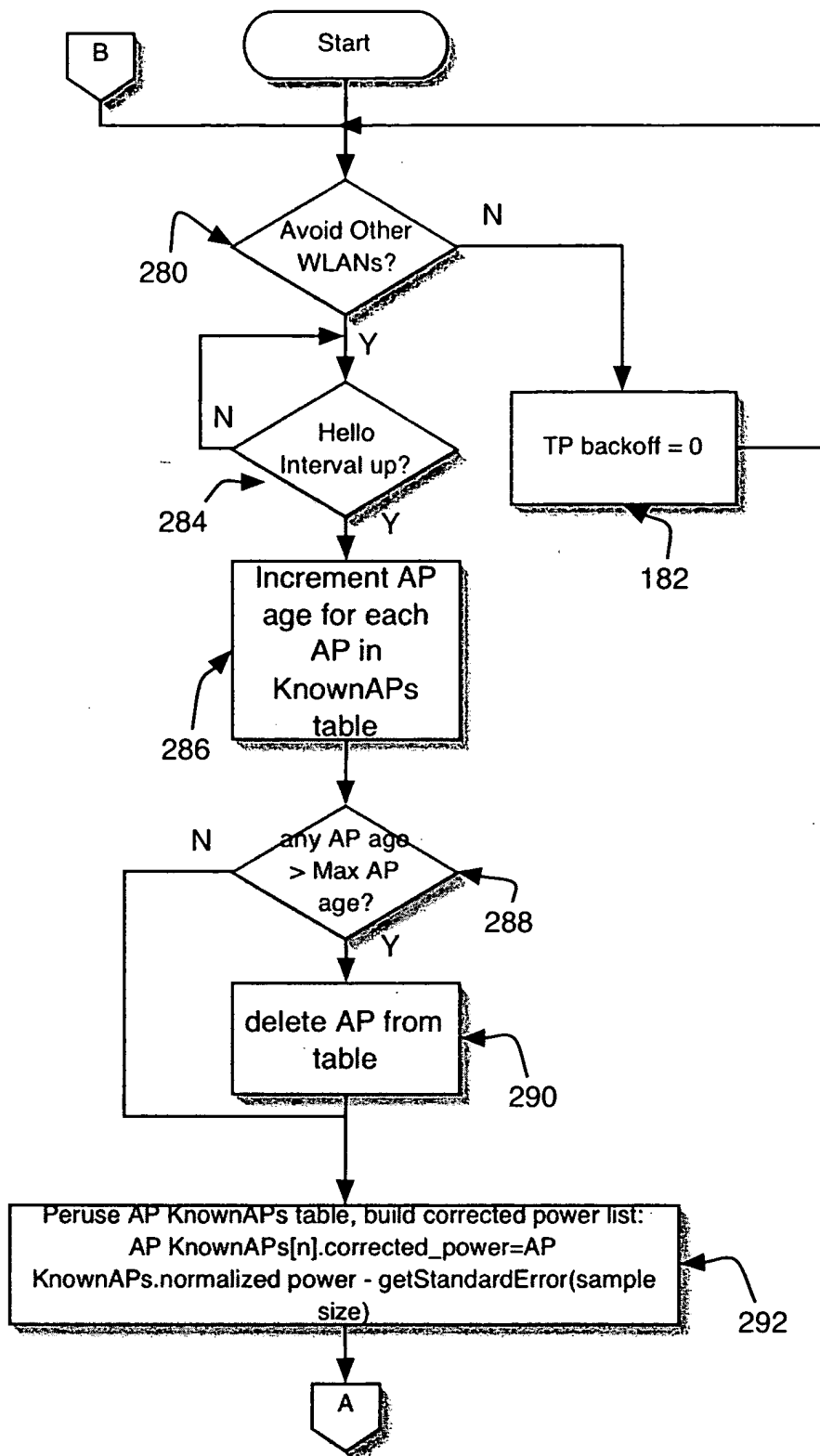


Fig. 18A

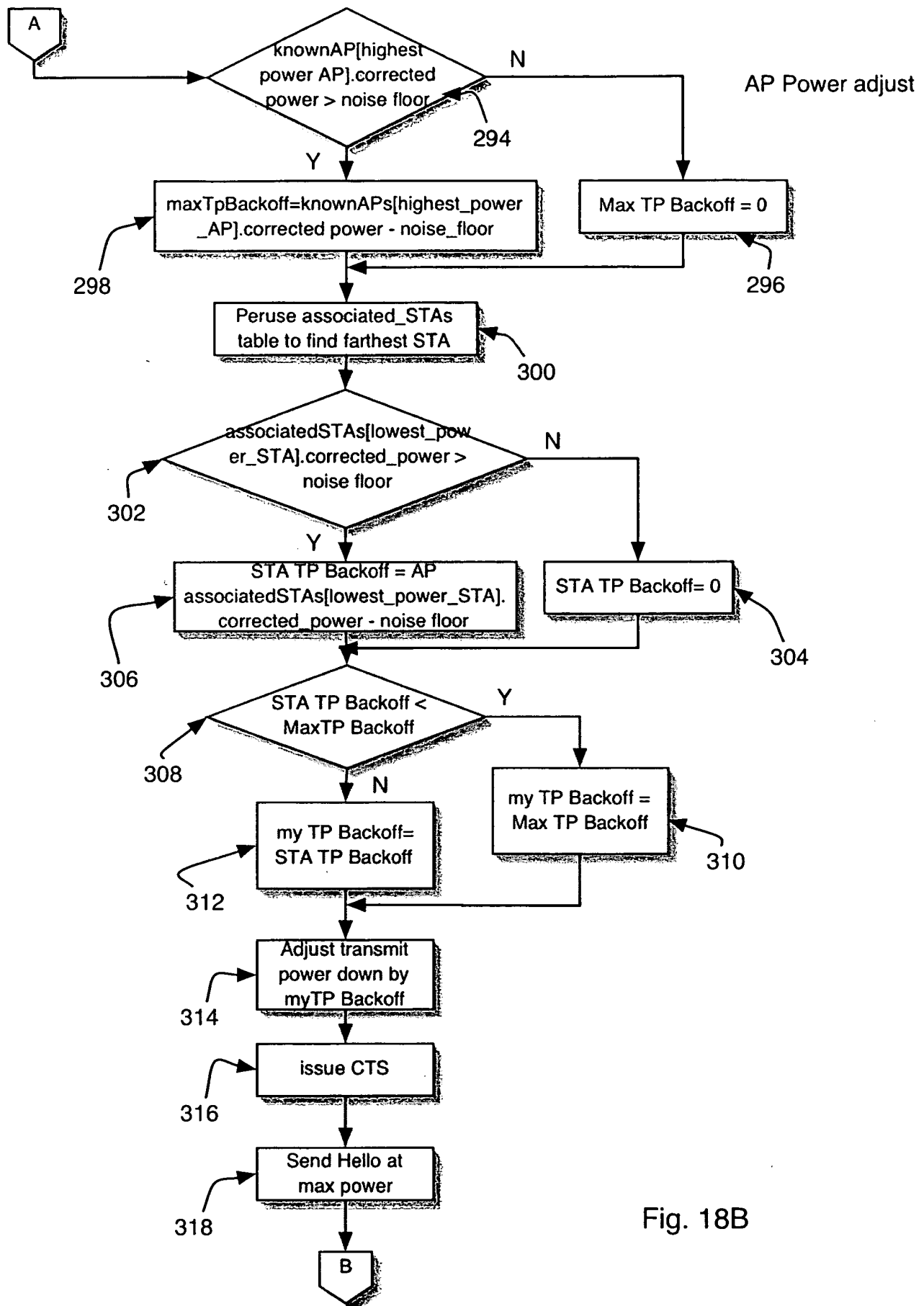


Fig. 18B

| Number of Samples | Calculated Standard Error (+/- dB) | Rounded Standard Error (+/- dB) |
|-------------------|------------------------------------|---------------------------------|
| 2                 | 38.6                               | 39                              |
| 4                 | 22.3                               | 22                              |
| 8                 | 14.6                               | 15                              |
| 16                | 9.94                               | 10                              |
| 32                | 6.9                                | 7                               |
| 64                | 4.9                                | 5                               |
| 128               | 3.4                                | 3                               |
| 256               | 2.3                                | 2                               |
| 512               | 1.7                                | 2                               |
| 1024              | .8<dB<1.7                          | 1                               |
| 2000              | .8                                 | 1                               |
| 2048              | 0<dB<.8                            | 1                               |

Table I

Standard error for 99% confidence on received power values averaged over number of samples for standard deviation = 15 dB.

Fig. 19

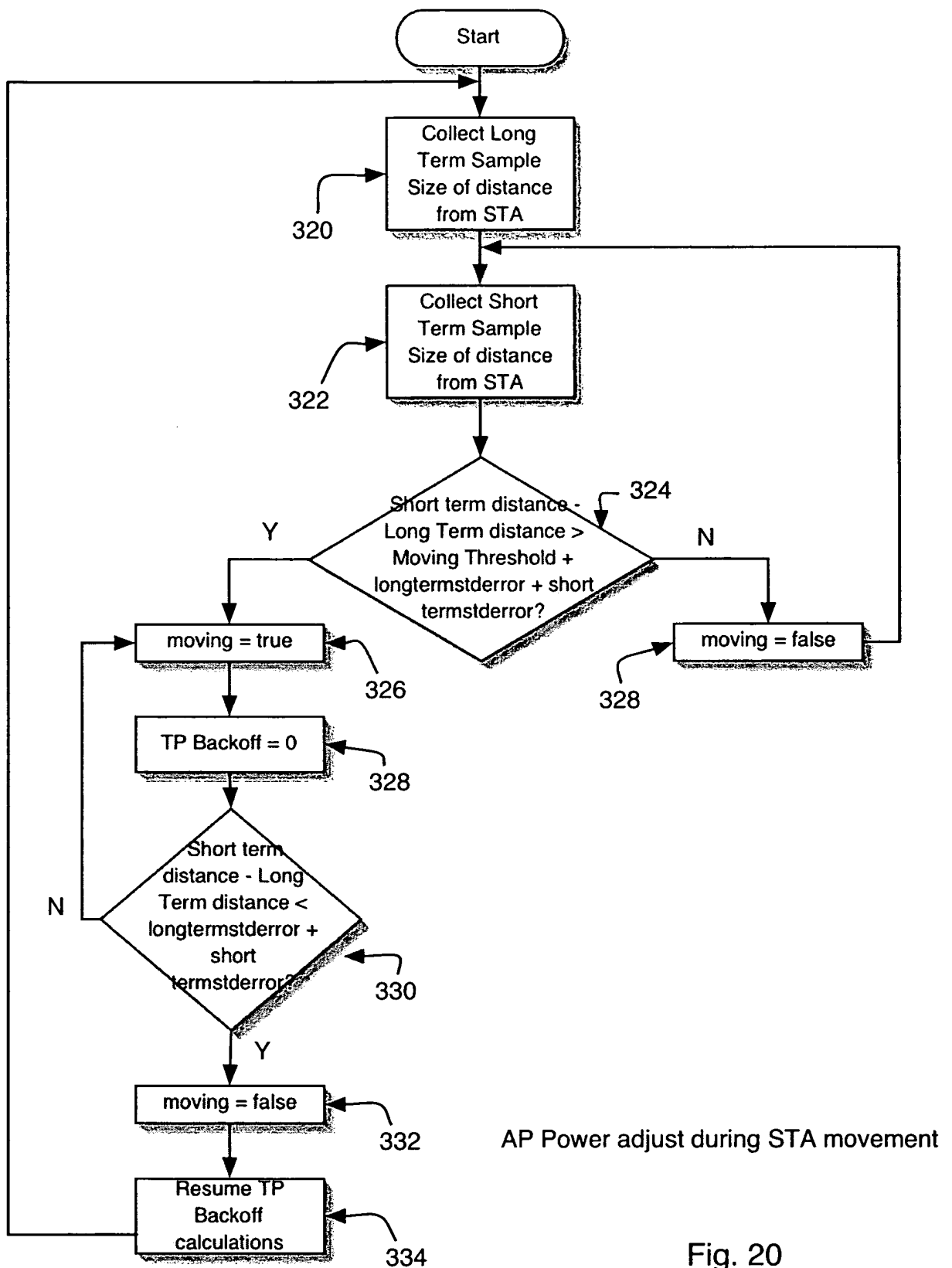


Fig. 20

# AP Auction

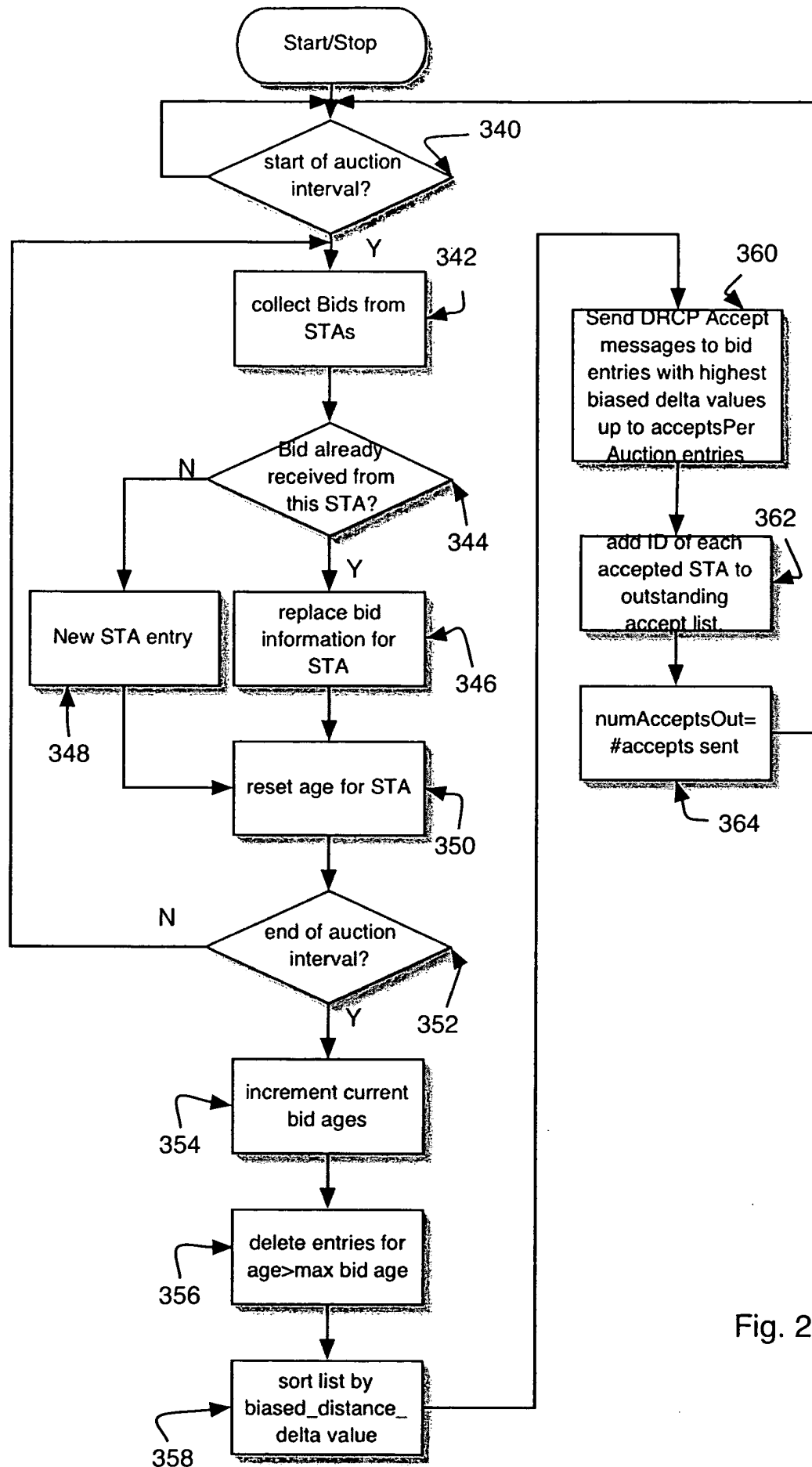


Fig. 21

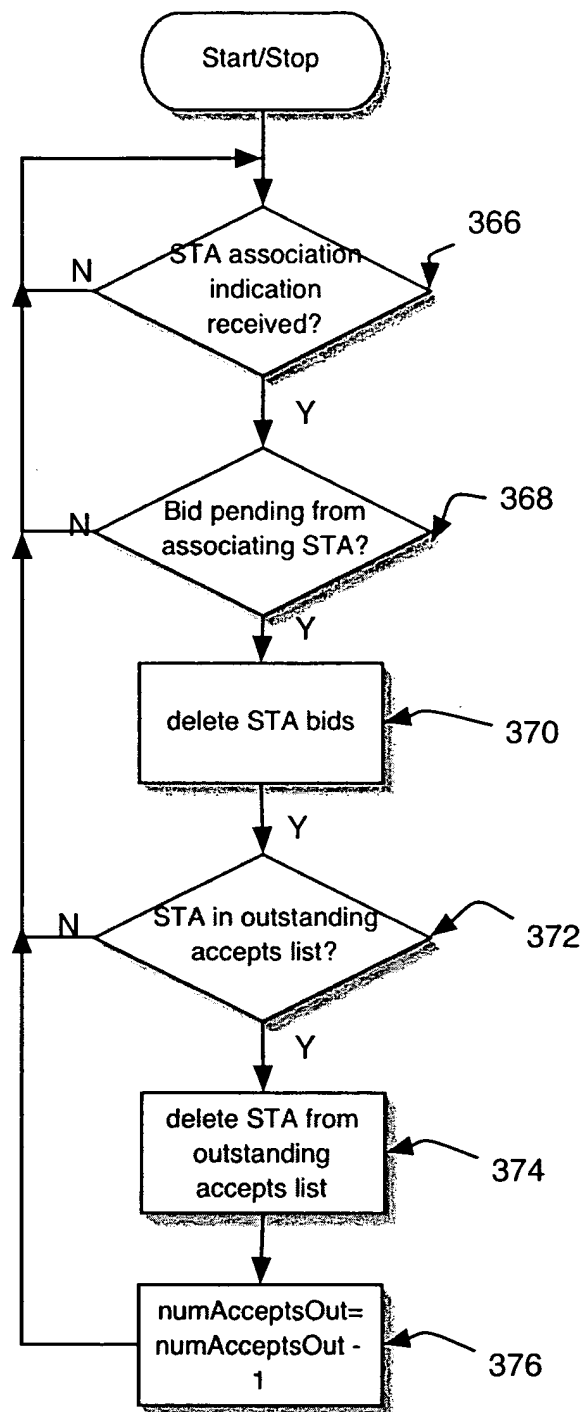


Fig. 22



## STA Initialization

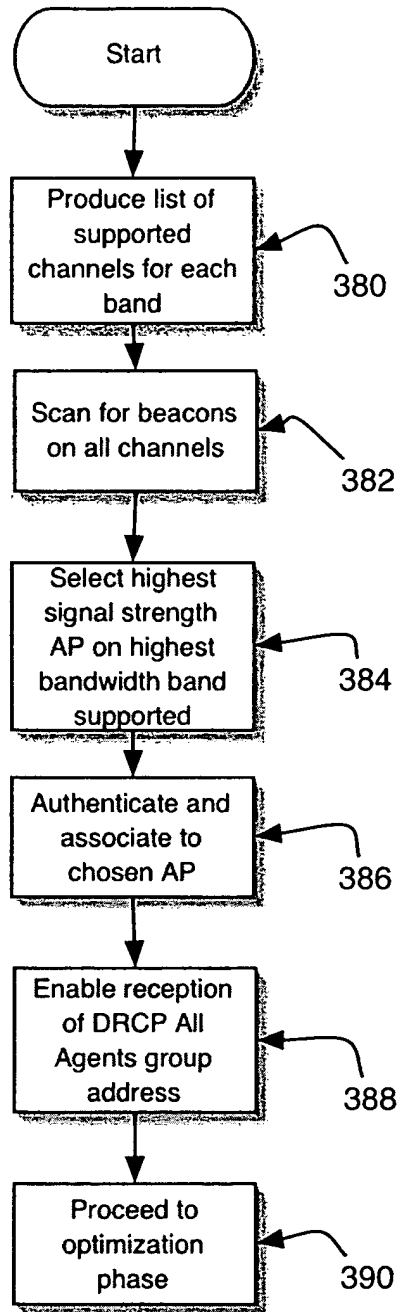


Fig. 23

## STA Canvassing

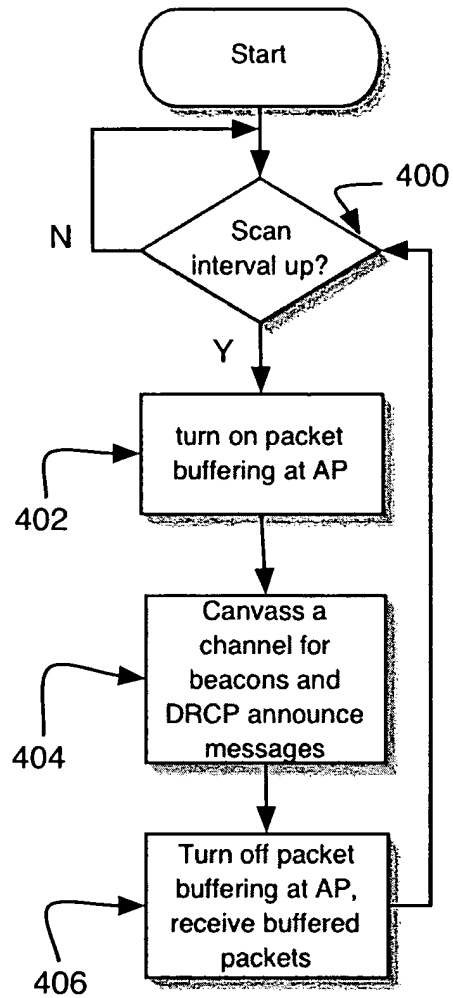


Fig. 24

STA Canvassing, 802.11

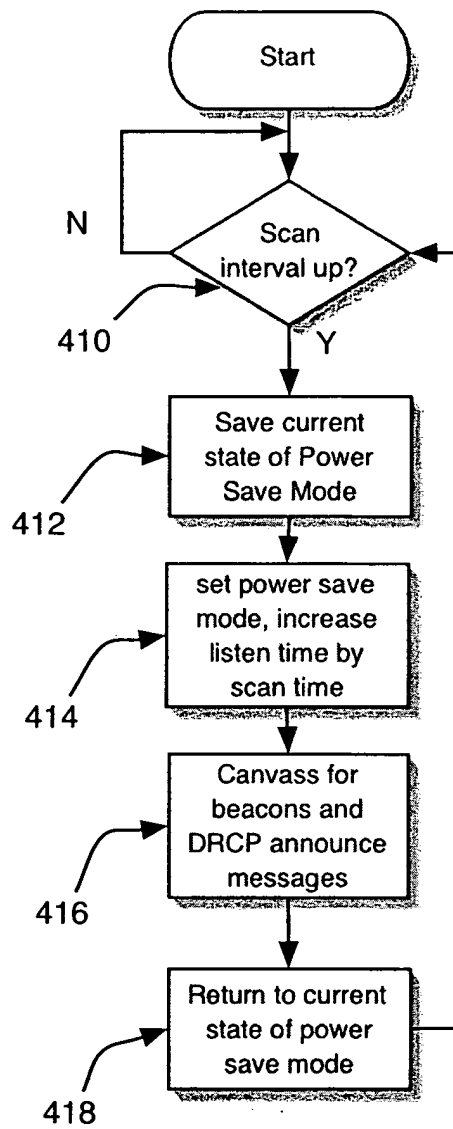


Fig. 25

430 →

| AP_ID      | Channel ID | age | Load Factor | TP Backoff | Max Power | distance_sample s | distance | my_Load Factor | biased distance | correcte d distance |
|------------|------------|-----|-------------|------------|-----------|-------------------|----------|----------------|-----------------|---------------------|
| AP[1]      | 3          | 2   | 2           | <list>     | <list>    | 10                | avg      | 2              | 2               | 2                   |
| AP[2]      | 7          | 3   | 3           | <list>     | <list>    | 7                 |          | 3              | 3               | 3                   |
| ...        | 5          | ... | ...         | ...        | ...       | ...               | ...      | ...            | ...             | ...                 |
| AP[MAX_AP] | 2          | 1   | 1           | <list>     | <list>    | 13                |          | 1              | 1               | 1                   |

STA Known APs Table

Fig. 26

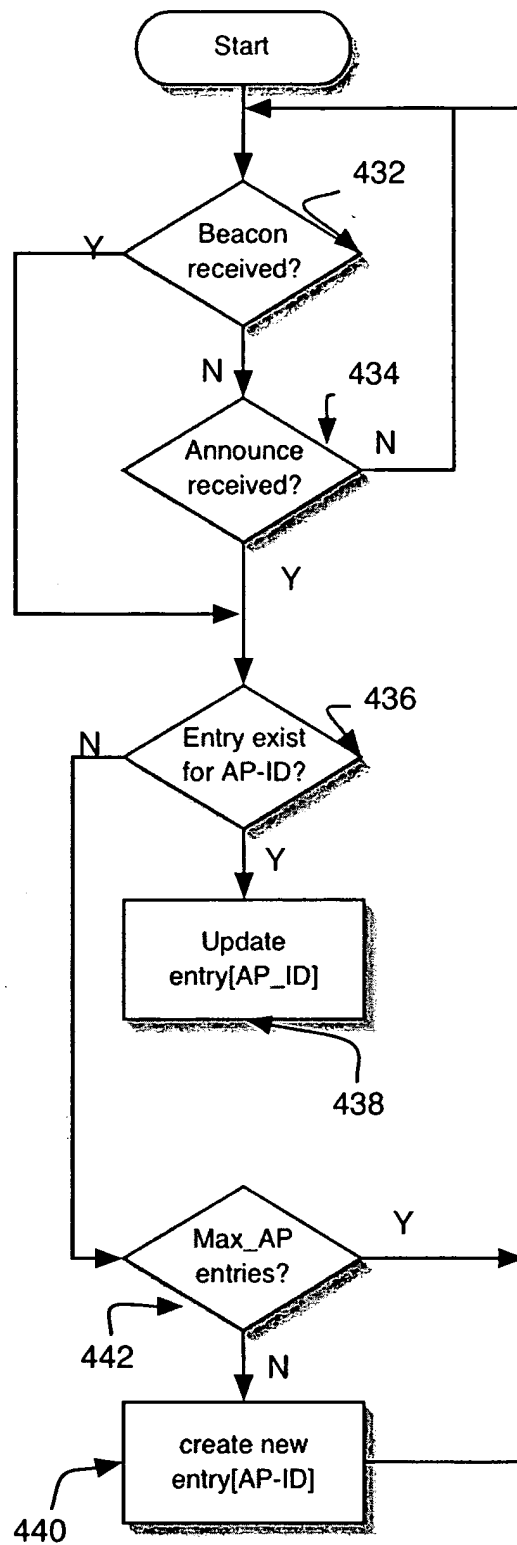


Fig. 27

## STA Power Adjustment

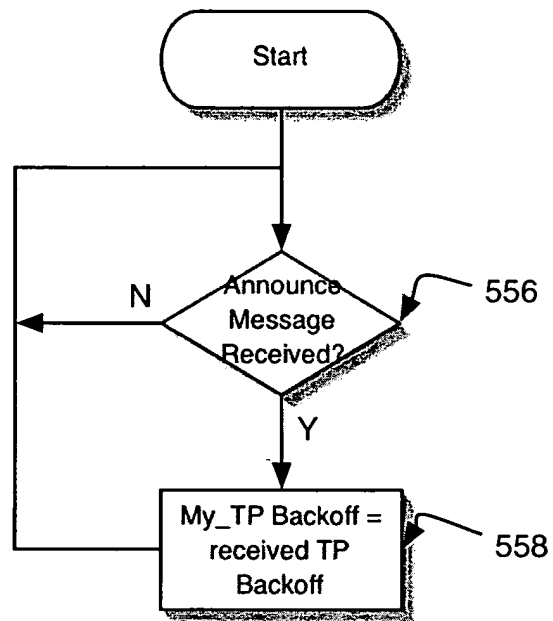


Fig. 28

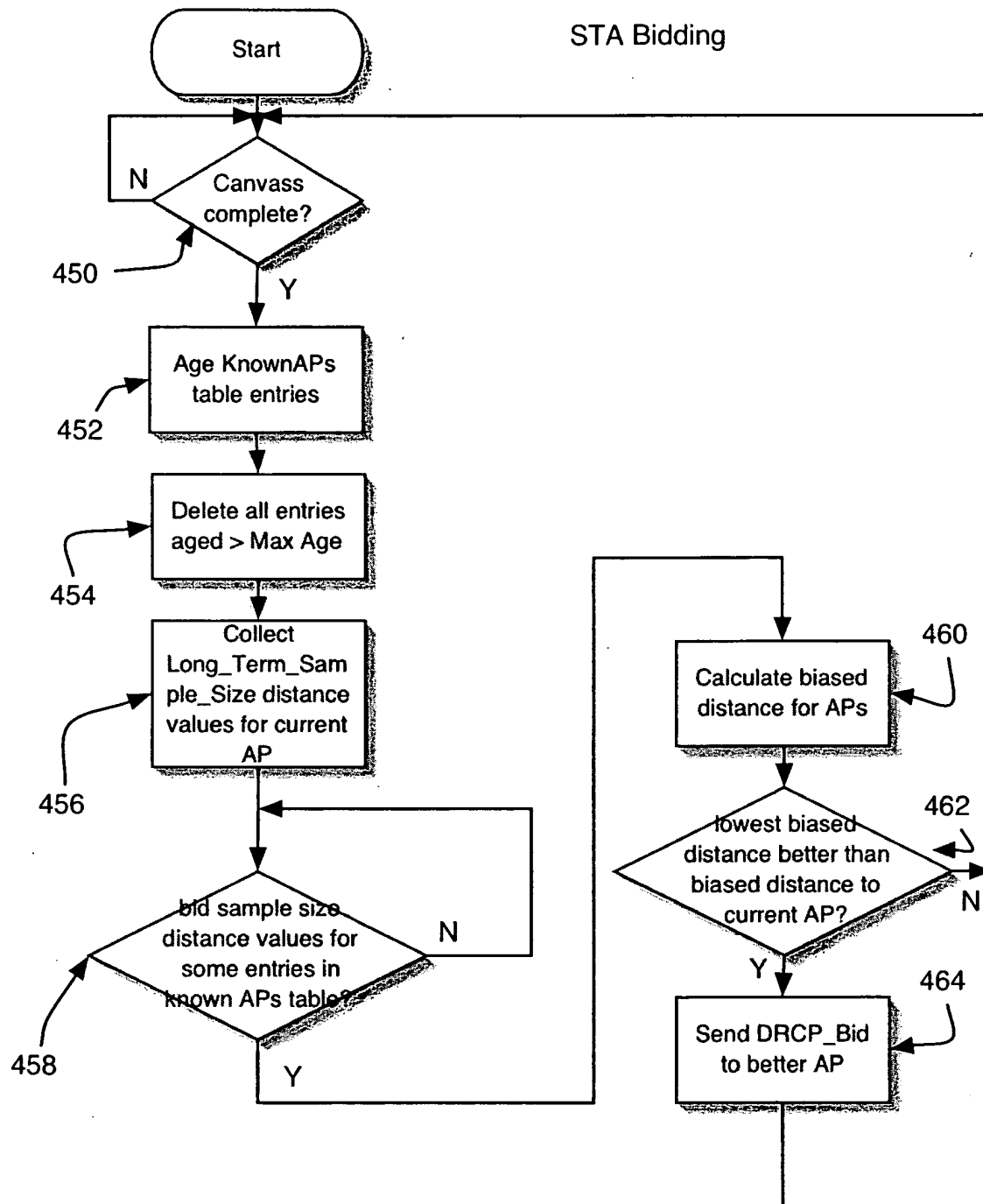


Fig. 29

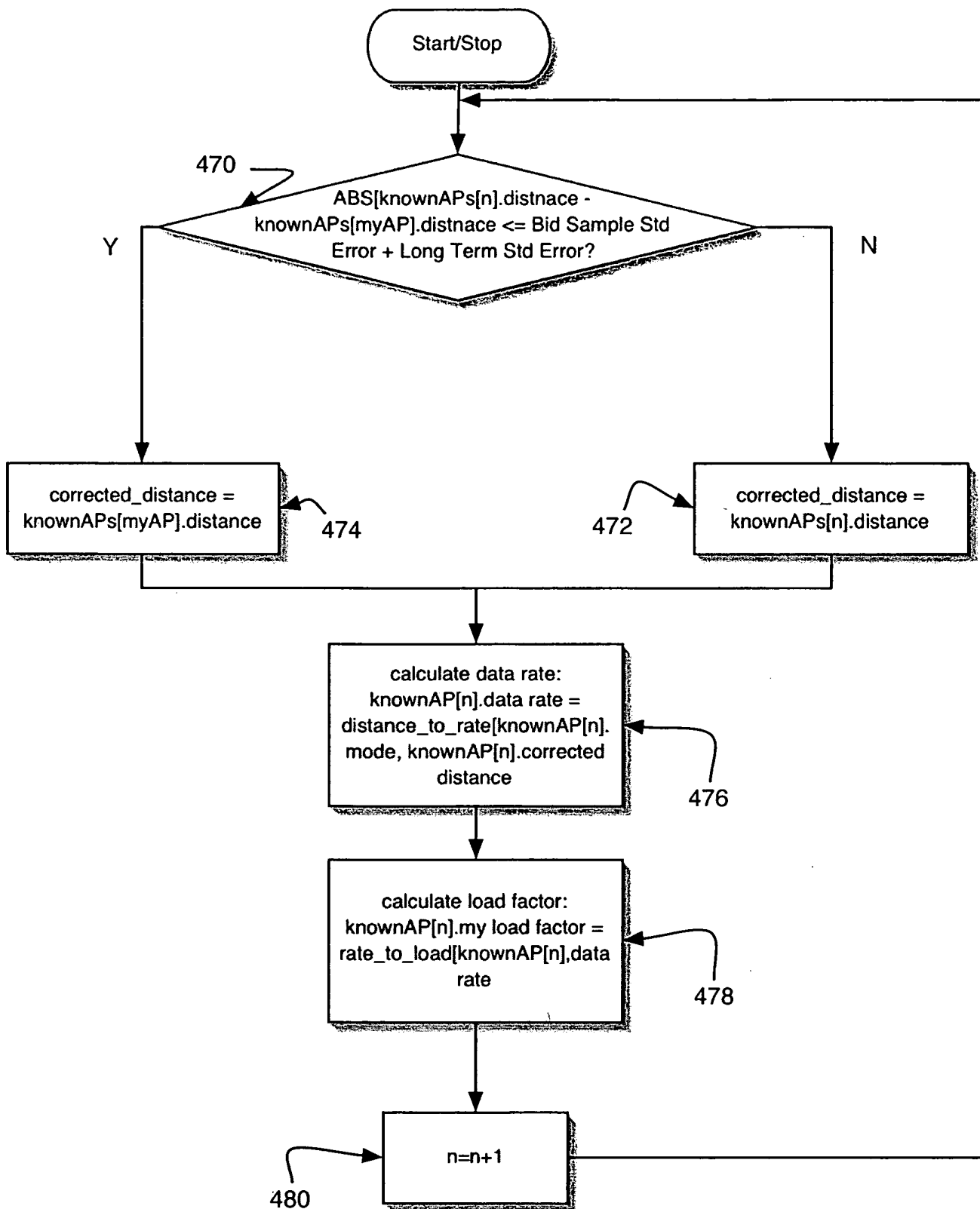


Fig. 30



| Distance in<br>Banzais | 802.11a, g<br>Mb/s | 802.11b<br>Mb/s |
|------------------------|--------------------|-----------------|
| 0-68                   | 54                 | 11              |
| 69-72                  | 48                 | 11              |
| 73-76                  | 36                 | 11              |
| 77-80                  | 24                 | 11              |
| 81-83                  | 18                 | 11              |
| 84-85                  | 12                 | 5.5             |
| 86                     | 9                  | 5.5             |
| 87                     | 9                  | 2               |
| 88                     | 6                  | 2               |
| 89                     | 2                  | 2               |
| 90-91                  | 2                  | 1               |
| 92-94                  | 1                  | 0               |
| 95-97                  | .5                 | 0               |

Table II  
Distance\_to\_Rate Table, 802.11

Fig. 31

| Data Rate | Load Factor |
|-----------|-------------|
| 108       | 4           |
| 72        | 6           |
| 54        | 8           |
| 48        | 9           |
| 36        | 12          |
| 24        | 18          |
| 18        | 24          |
| 11        | 39          |
| 9         | 48          |
| 6         | 72          |
| 5.5       | 79          |
| 2         | 216         |
| 1         | 432         |
| .5        | 864         |
| 0         | 65,535      |

Table III

Rate\_to\_Load table for 802.11

Fig. 32

## Biased Distance Calculation

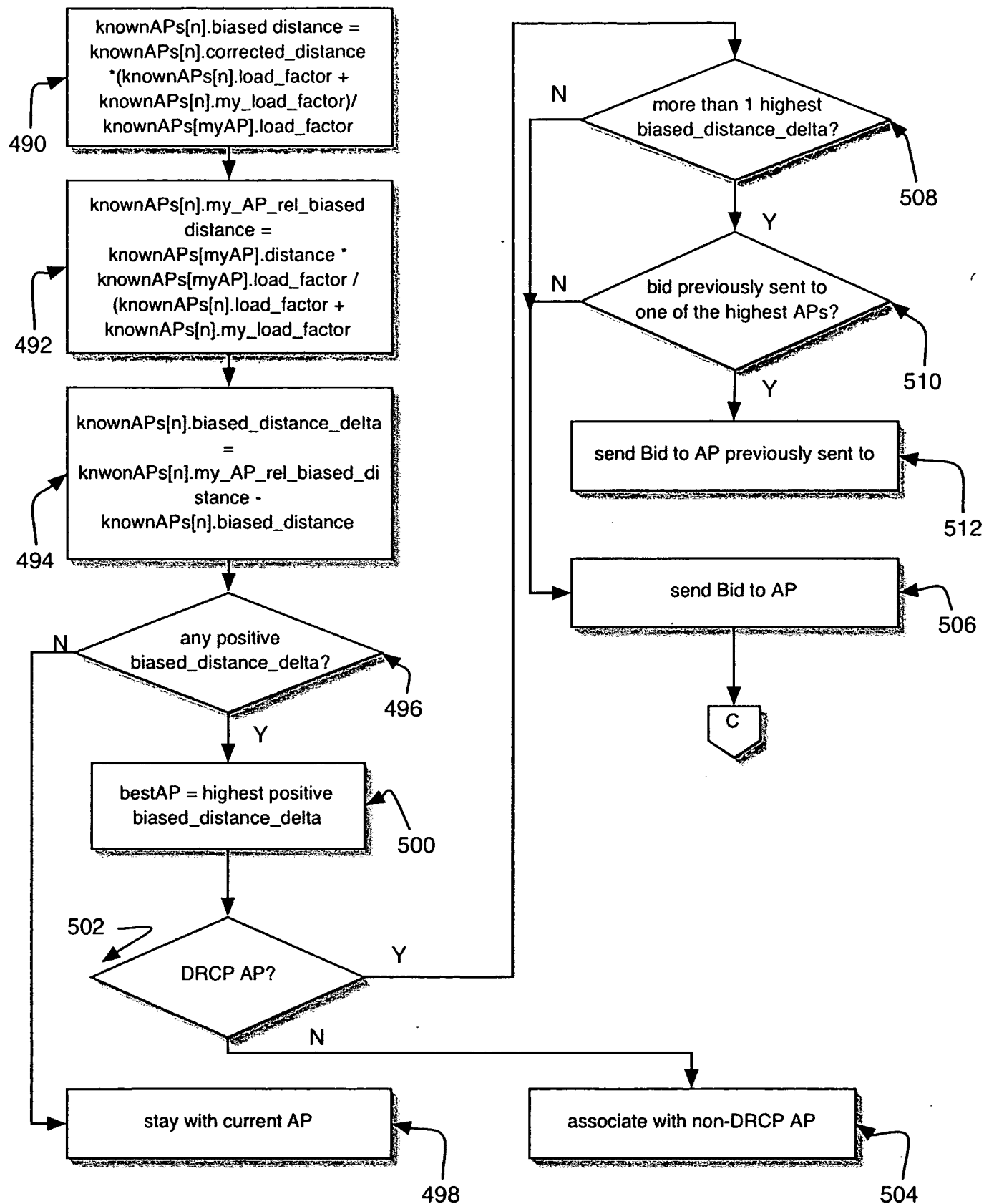


Fig. 33A

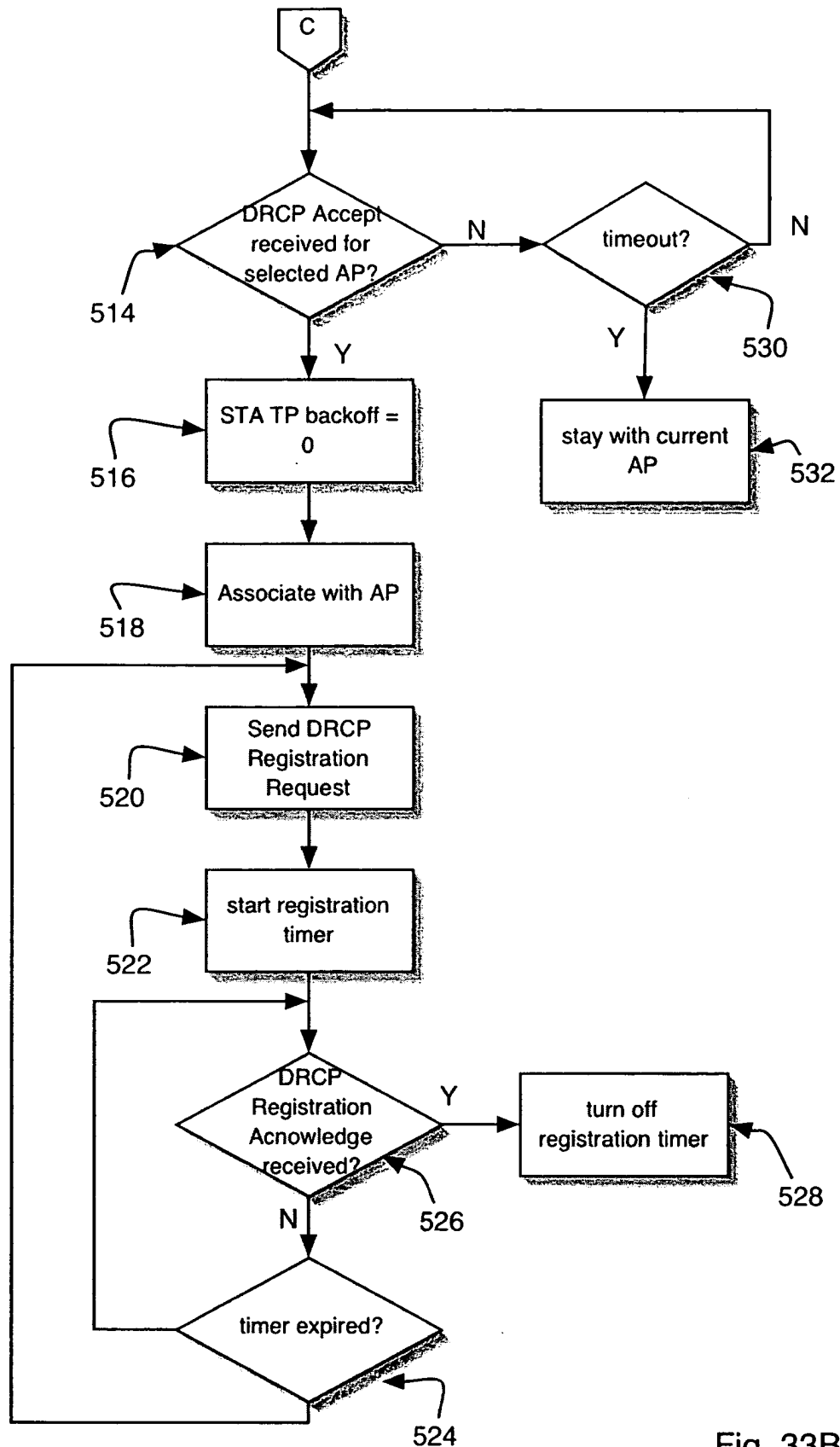


Fig. 33B

# STA movement detection

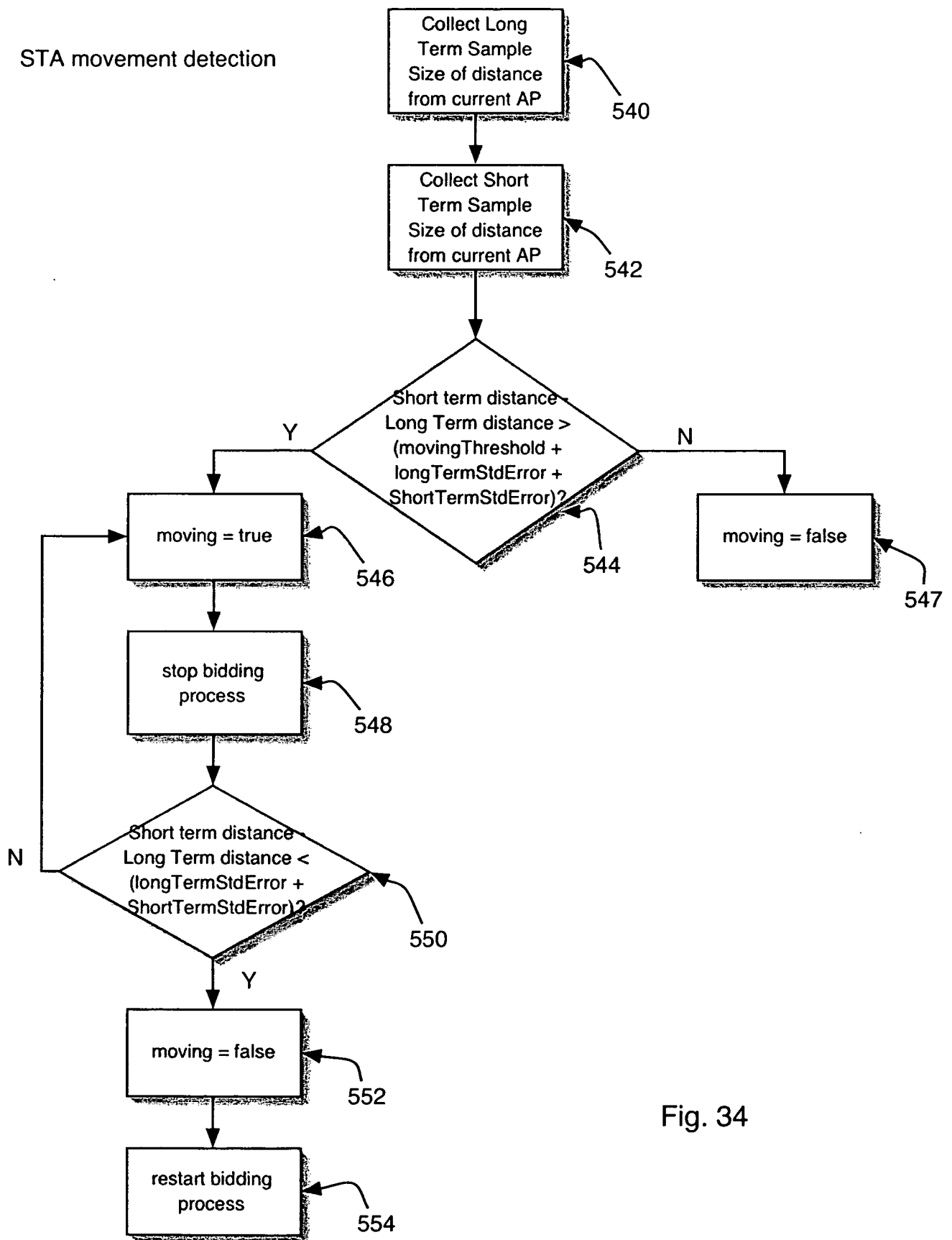


Fig. 34

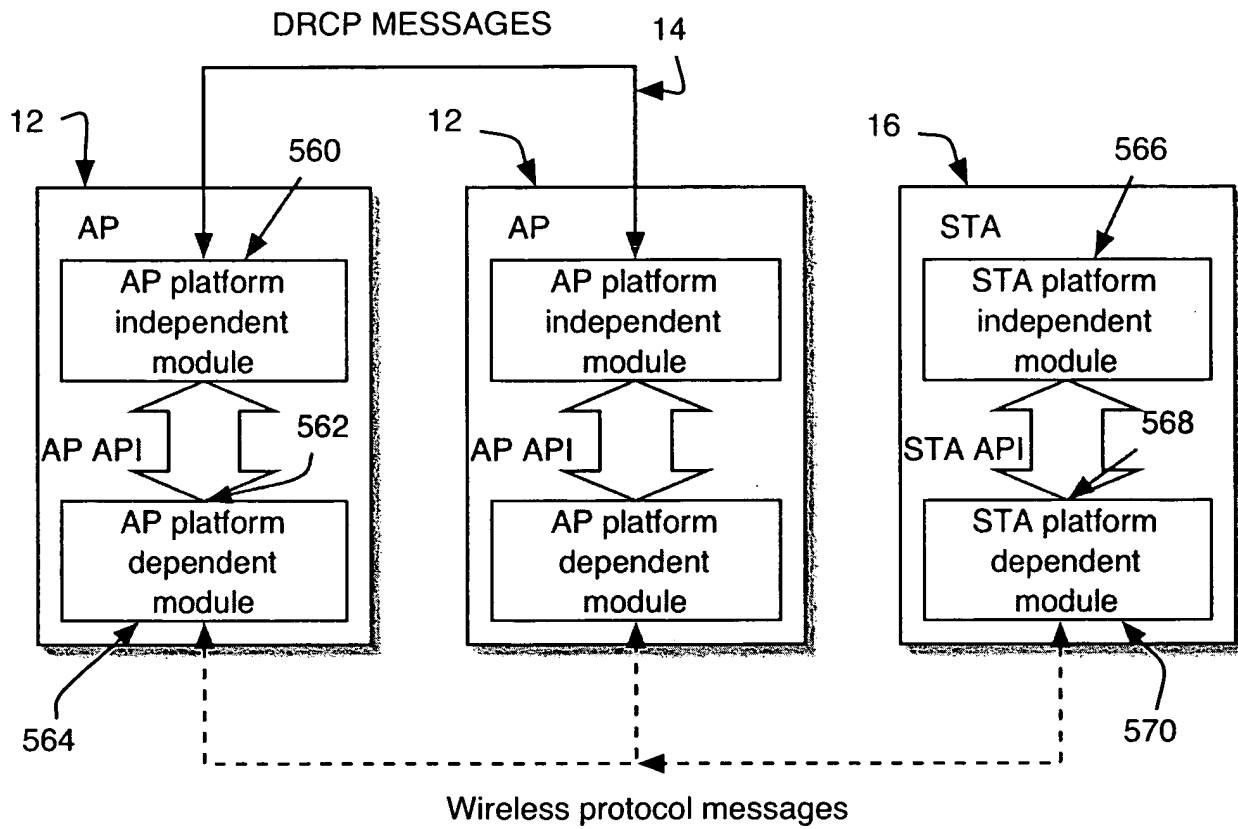


Fig. 35

## 802.11 AP DRCP Architecture

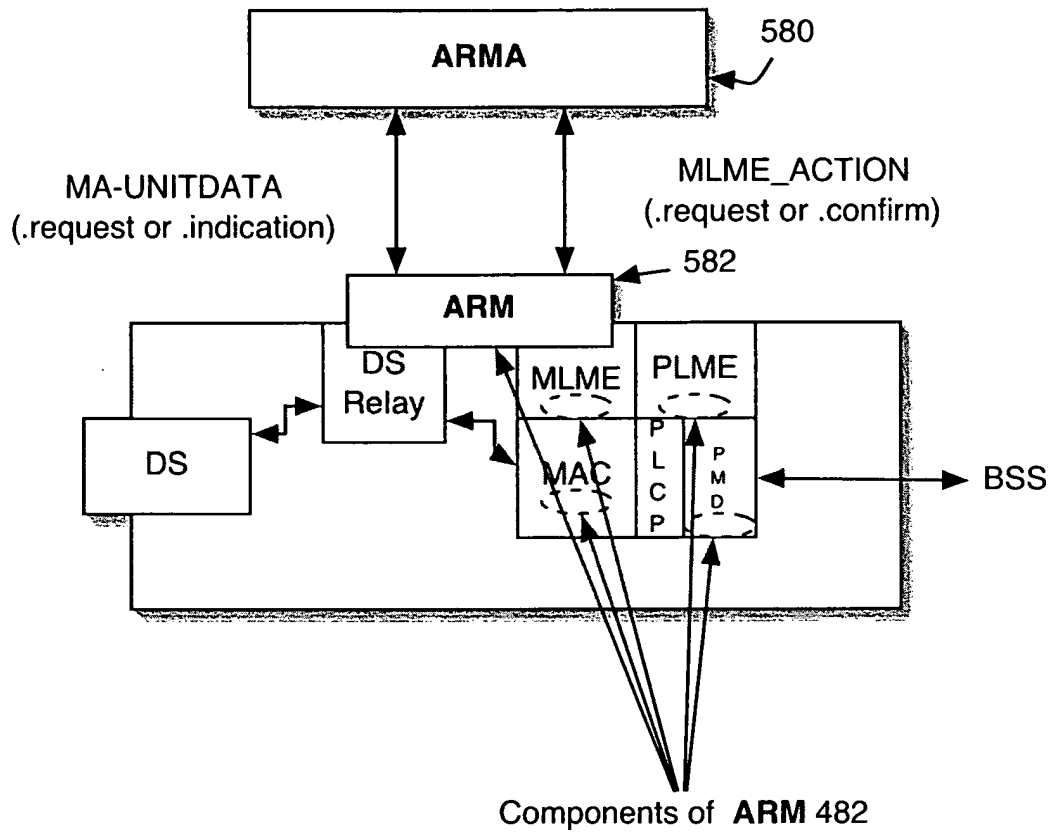


Fig. 36

802.11 STA DRCP Architecture

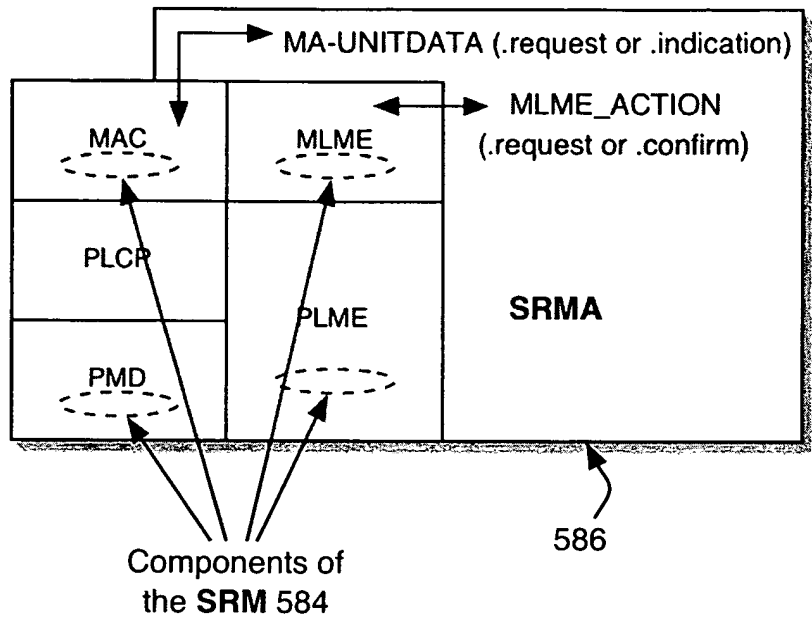


Fig. 37



# Encoding of DRCP Message in an 802.11 Management Frame of Subtype Beacon

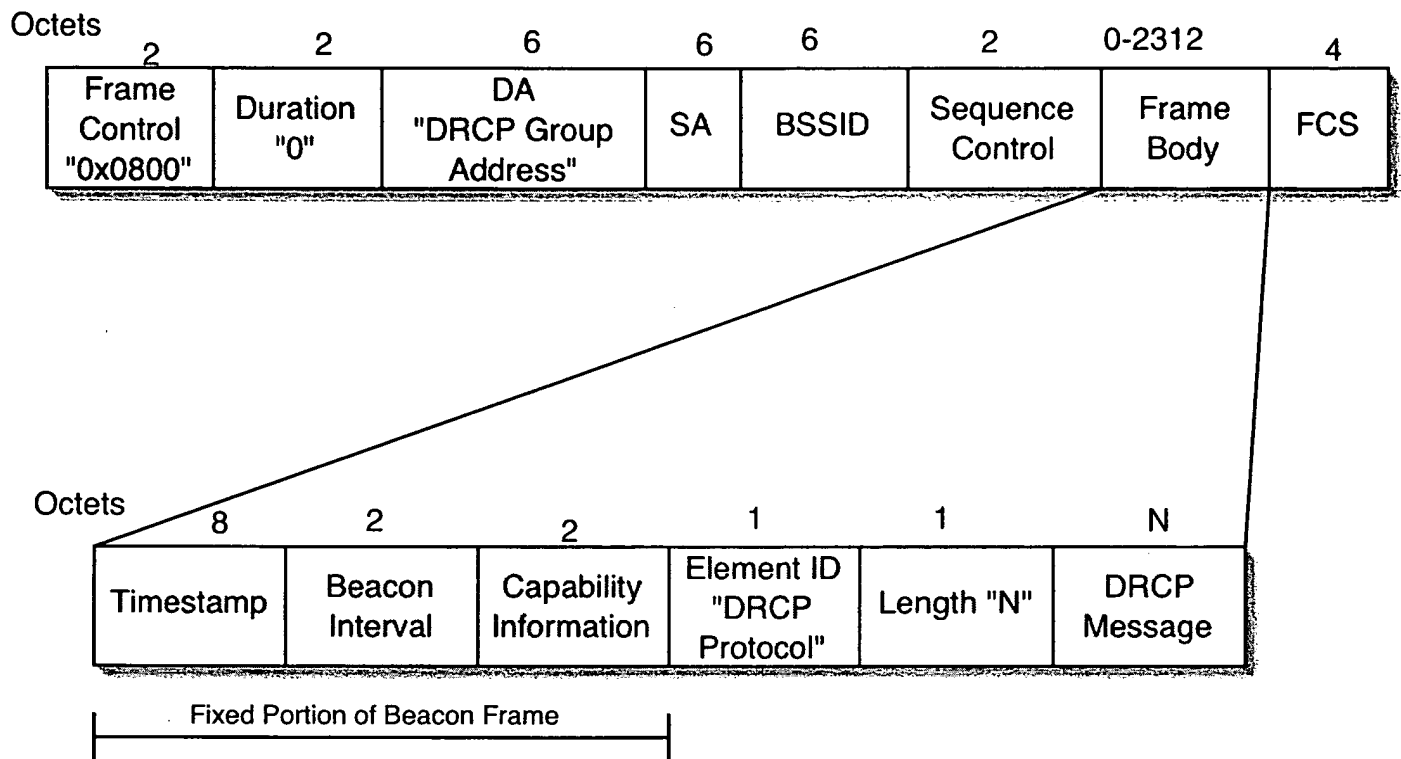


Fig. 38

# Encoding of DRCP Message in an 802.11 Data Frame

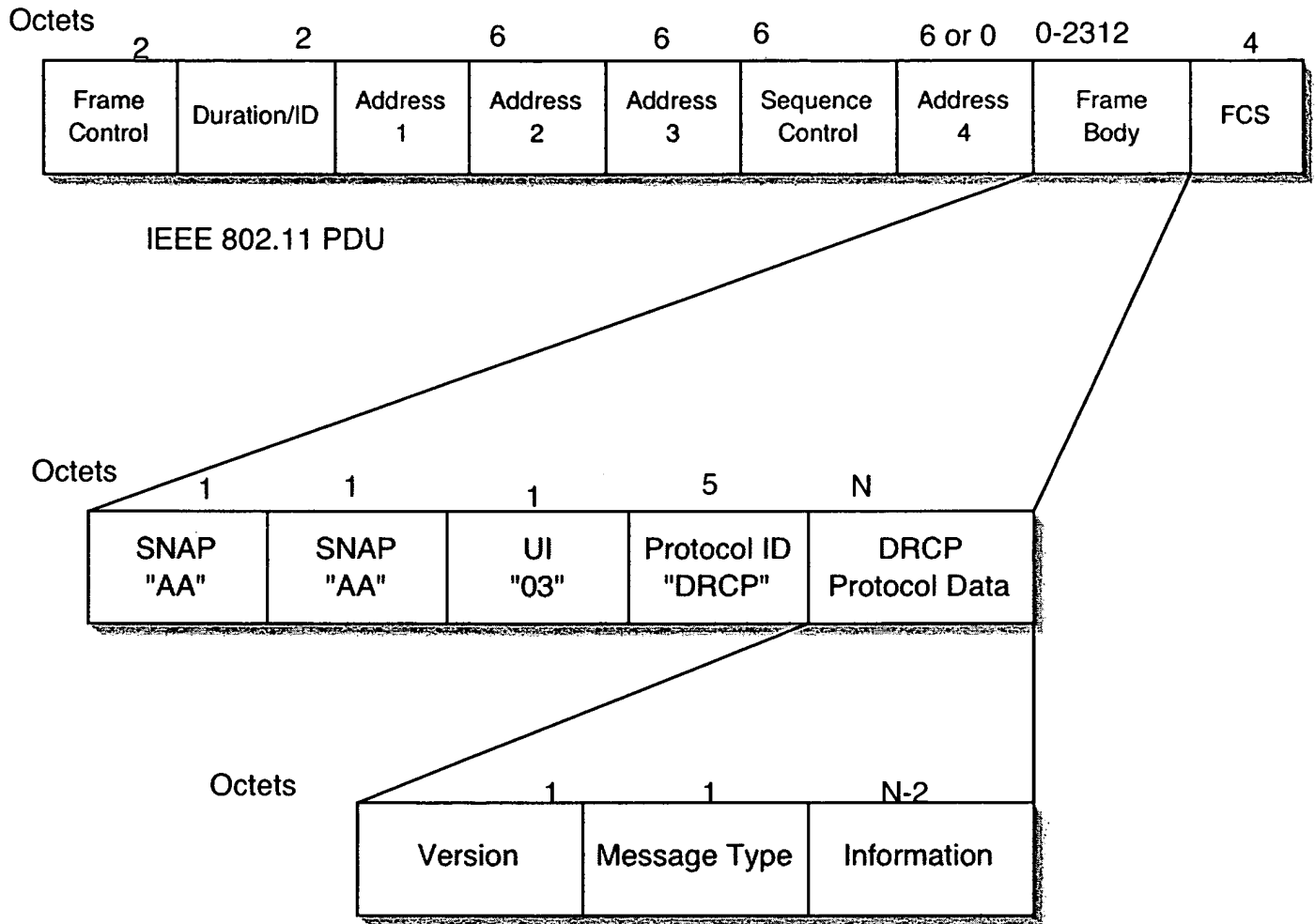


Fig. 39

| Message Type                  | Usage  | Data Rate       | Max Power              |
|-------------------------------|--|-----------------|------------------------|
| DRCP Preclaim                 | Used by ARMAs in the channel selection process                     | Lowest Datarate | Max Power              |
| DRCP Claim                    | Used by ARMAs in the channel selection process                     | Lowest Datarate | Max Power              |
| DRCP Announce                 | Used by ARMAs to announce their presence to SRMAs and other ARMAs. | Lowest Datarate | Max Power              |
| DRCP Bid                      | Used by SRMAs to bid for slots on ARMAs                            | STA Datarate    | Max Power - TP Backoff |
| DRCP Accept                   | Used by ARMAs to signal to SRMAs permission to associate           | STA Datarate    | Max Power - TP Backoff |
| DRCP Registration Request     | Used by STAs to tell ARMAs they will associate                     | STA Datarate    | Max Power - TP Backoff |
| DRCP Registration Acknowledge | Used by ARMAs to tell STA it received registration request         | STA Datarate    | Max Power - TP Backoff |

Fig. 40

| Name                  | Size | Description  |
|-----------------------|------|--|
| Type                  | 1    | Message type. Values:<br>1 = DRCP Claim<br>2 = DRCP Announce<br>3 = DRCP Preclaim<br>4 = DRCP Bid<br>5 = DRCP Accept<br>6 = DRCP Registration Request<br>7 = DRCP Registration Acknowledge |
| Channel ID            | 1    | Indicates the channel of the originating station   |
| AP-ID                 | 6    | The MAC Address of the AP in which the transmitting ARMA is instantiated   |
| SSID                  | 32   | The Service Set ID (SSID) of the AP in which the transmitting ARMA is instantiated. This value is also referred to as the "Network Name".  |
| Load Factor           | 2    | The sum of the loads of the ATAs currently associated to the transmitting AP.  |
| TP Backoff            | 2    | Transmit power backoff value in use by the transmitting AP.  |
| Max Power             | 2    | Maximum power output, in dBm, of the transmitting AP's radio.  |
| Biased Distance Delta | 4    | The difference between the biased distance from the transmitting STA to its current AP and the destination AP.   |
| STA ID                | 6    | The MAC address of the STA in which the transmitting SRMA is instantiated.   |
| STA Assoc AP ID       | 6    | The MAC address of the AP to which the transmitting STA is currently associated.   |
| Bid AP ID             | 6    | The MAC address of the AP to which the transmitting STA is bidding.  |
| Accepted STA ID       | 6    | The MAC address of the STA that the sending AP is accepting.   |
| STA Reported AP ID    | 6    | The MAC address of the AP that was identified in the last Bid message as the accepted STA's associated AP.   |
| Max TP Backoff        | 2    | Max dB's backoff capable of an AP  |
| Adjacency Vector Sum  | 2    | Sum of received power levels from all APs heard during scanning and preclaiming.   |

Fig. 41

Byte Address

|   |              |      |                         |            |
|---|--------------|------|-------------------------|------------|
| 0 | Version      | Type | Flags                   | Channel ID |
| 4 | AP ID (MSBs) |      |                         |            |
| 8 | AP ID (LSBs) |      | Max Backoff   Max power |            |

DRCP Preclaim Message

Fig. 42

Byte Address

|    |                      |      |                         |            |
|----|----------------------|------|-------------------------|------------|
| 0  | Version              | Type | Flags                   | Channel ID |
| 4  | AP ID (MSBs)         |      |                         |            |
| 8  | AP ID (LSBs)         |      | Max Backoff   Max Power |            |
| 12 | Adjacency Vector Sum |      | Reserved                |            |

DRCP Claim Message

Fig. 43

Byte Address

|    |                       |      |                         |            |
|----|-----------------------|------|-------------------------|------------|
| 0  | Version               | Type | Flags                   | Channel ID |
| 4  | AP ID (MSBs)          |      |                         |            |
| 8  | AP ID (LSBs)          |      | Max Backoff   Max Power |            |
| 12 | TP Backoff   Reserved |      | Load Factor             |            |

DRCP Announce Message

Fig. 44

Byte Address

|    |                        |      |                        |            |
|----|------------------------|------|------------------------|------------|
| 0  | Version                | Type | Flags                  | Channel ID |
| 4  | Biased Distance Delta  |      |                        |            |
| 8  | STA ID (MSBs)          |      |                        |            |
| 12 | STA ID (LSBs)          |      | STA Assoc AP ID (MSBs) |            |
| 16 | STA Assoc AP ID (LSBs) |      |                        |            |
| 20 | Bid AP ID (MSBs)       |      |                        |            |
| 24 | Bid AP (LSBs)          |      | Reserved               |            |

DRCP Bid Message

Fig. 45



Byte Address

|    |                           |      |                        |            |
|----|---------------------------|------|------------------------|------------|
| 0  | Version                   | Type | Flags                  | Channel ID |
| 4  | AP ID (MSBs)              |      |                        |            |
| 8  | AP ID (LSBs)              |      | Accepted STA ID (MSBs) |            |
| 12 | Accepted STA ID (LSBs)    |      |                        |            |
| 16 | STA Reported AP ID (MSBs) |      |                        |            |
| 20 | STA Reported AP ID (LSBs) |      | Reserved               |            |

DRCP Accept Message

Fig. 46

Byte Address

|    |                        |      |                        |            |
|----|------------------------|------|------------------------|------------|
| 0  | Version                | Type | Flags                  | Channel ID |
| 4  | AP ID (MSBs)           |      |                        |            |
| 8  | AP ID (LSBs)           |      | Accepted STA ID (MSBs) |            |
| 12 | Accepted STA ID (LSBs) |      |                        |            |

DRCP Registration Request Message

Fig. 47

Byte Address

|    |                        |      |                        |            |
|----|------------------------|------|------------------------|------------|
| 0  | Version                | Type | Flags                  | Channel ID |
| 4  | AP ID (MSBs)           |      |                        |            |
| 8  | AP ID (LSBs)           |      | Accepted STA ID (MSBs) |            |
| 12 | Accepted STA ID (LSBs) |      |                        |            |

DRCP Registration Acknowledge Message

Fig. 48

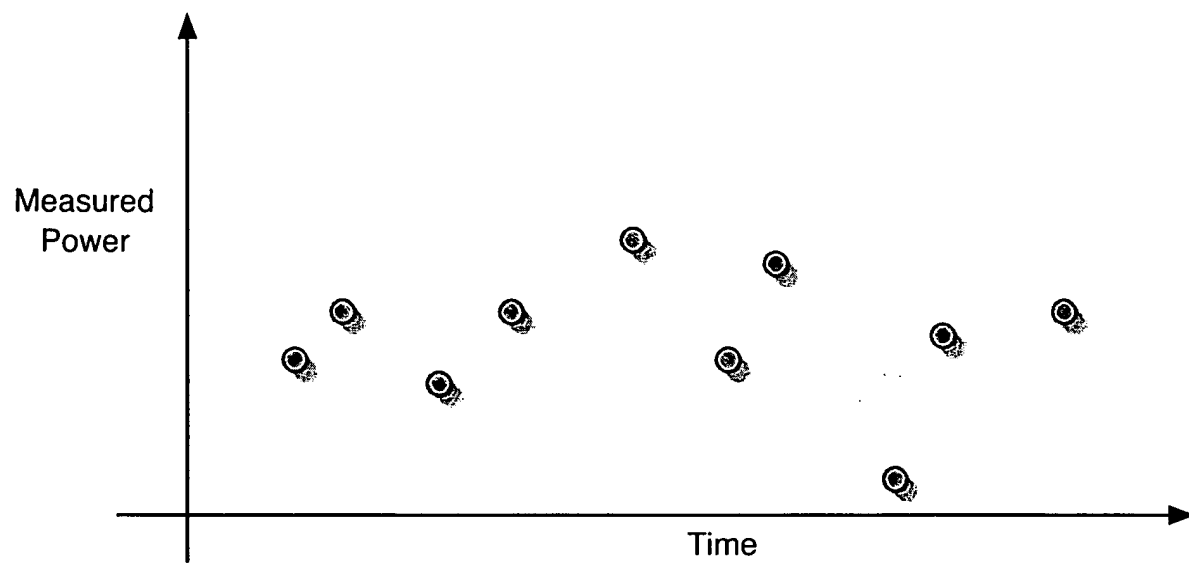


Fig. 49

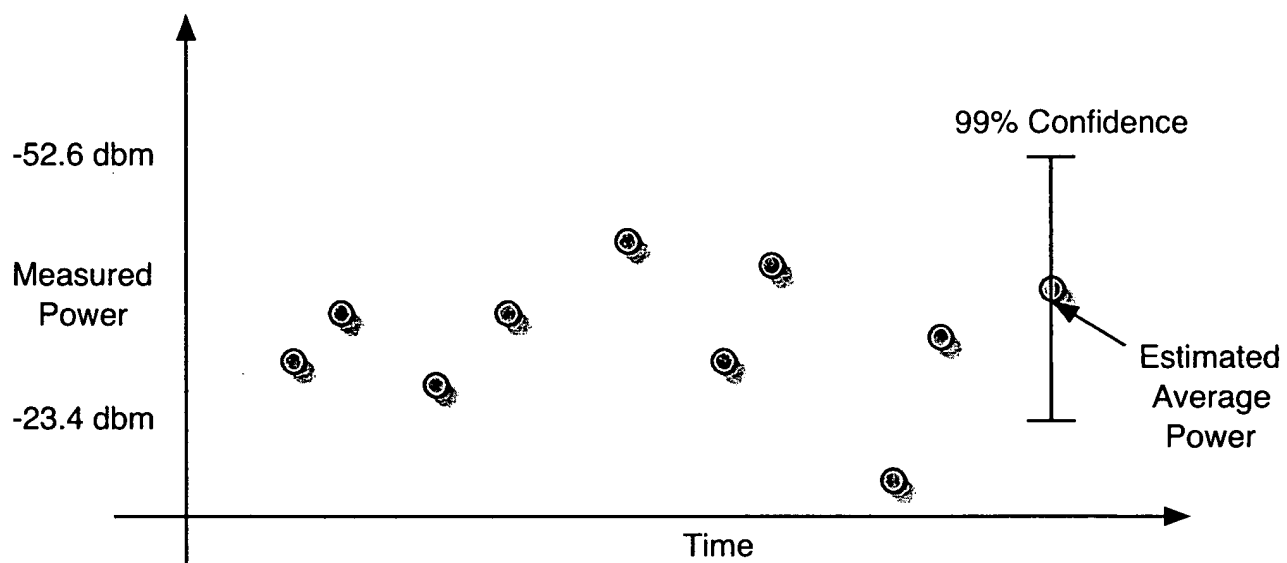


Fig. 50

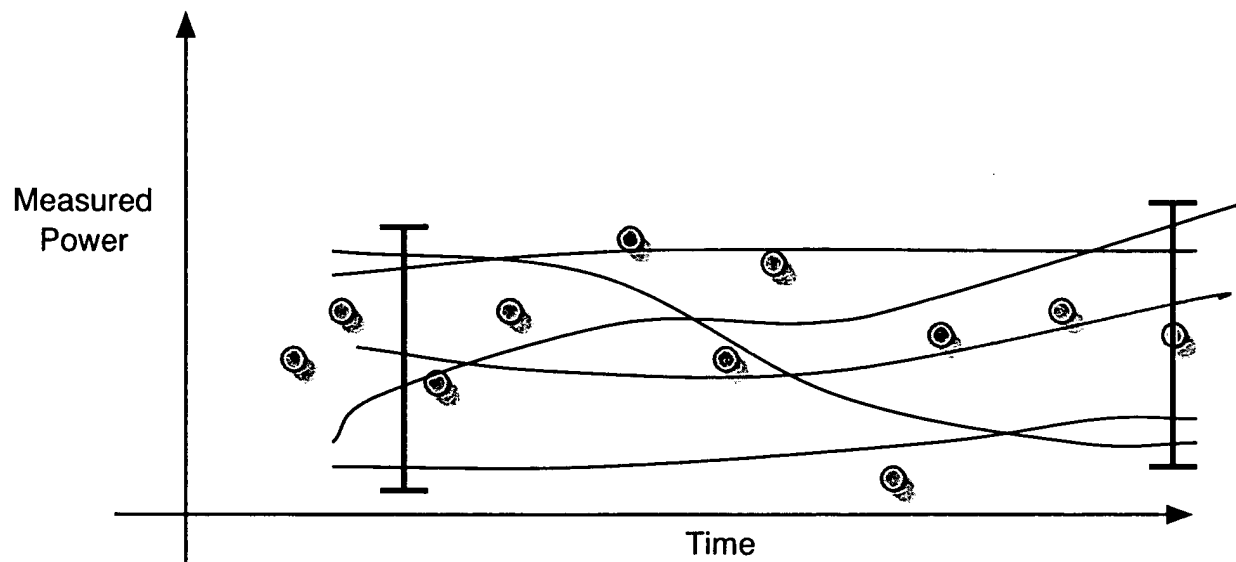


Fig. 51

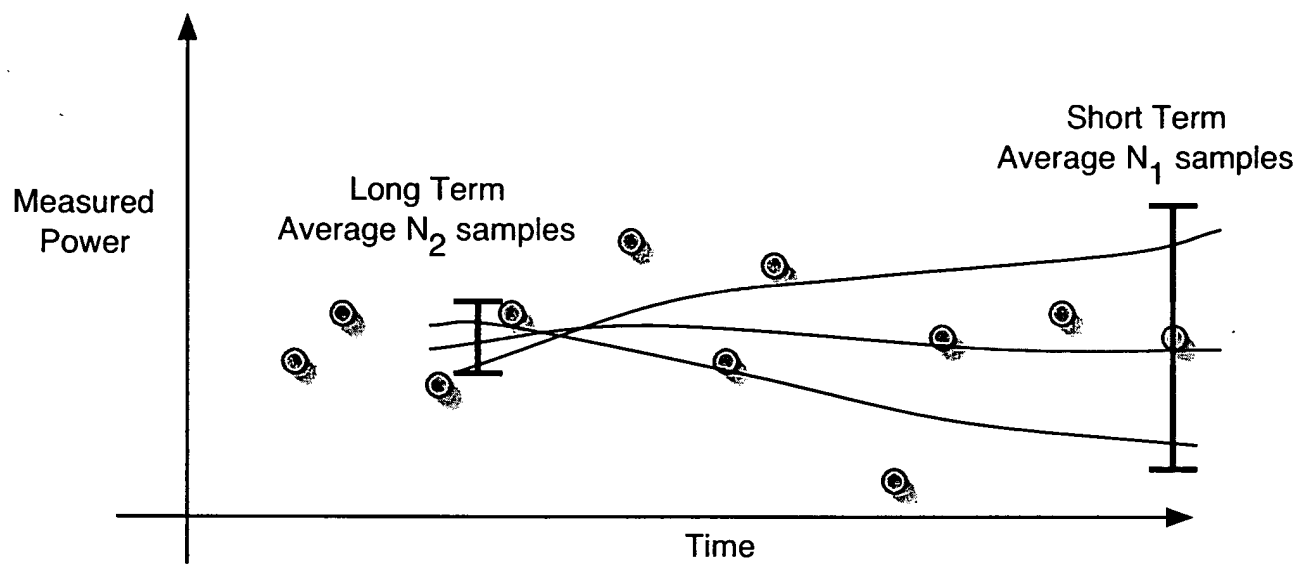


Fig. 52

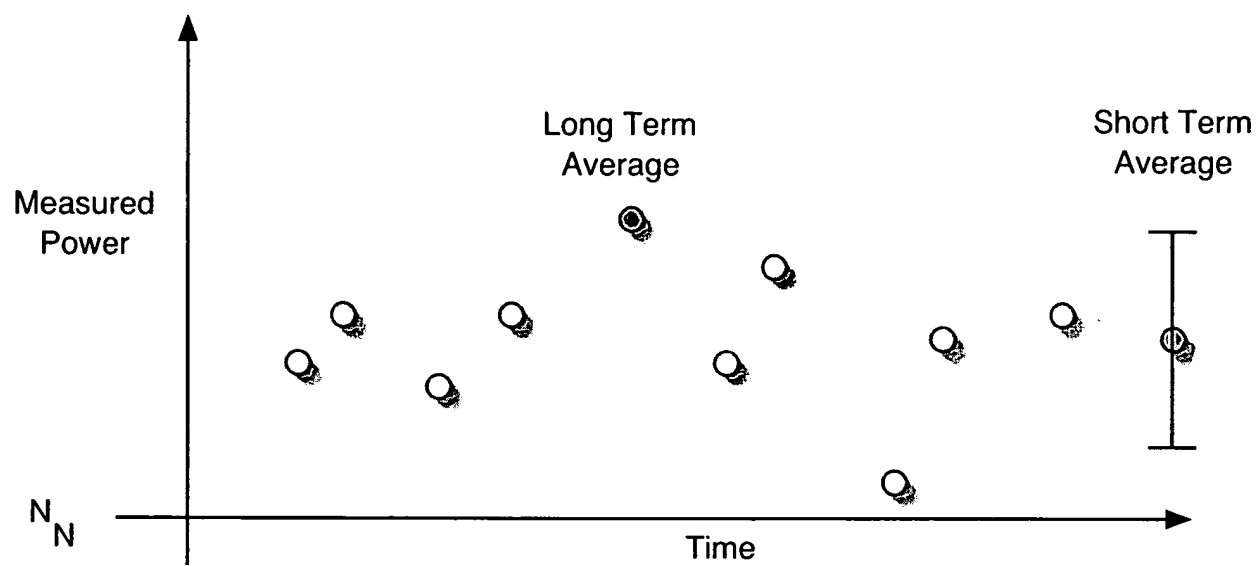


Fig. 53



| Sample Time Duration | # Power Samples (N2) | Upper 99% Confidence Interval | Lower 99% Confidence Interval |
|----------------------|----------------------|-------------------------------|-------------------------------|
| 1 sec                | 20                   | -29.1 dbm                     | -46.9 dbm                     |
| 10 sec               | 200                  | -35.3 dbm                     | -40.7 dbm                     |
| 100 sec              | 2000                 | -37.2 dbm                     | -38.3 dbm                     |
| 1000 sec             | 20,000               | -37.7 dbm                     | -38.3 dbm                     |

Fig. 54

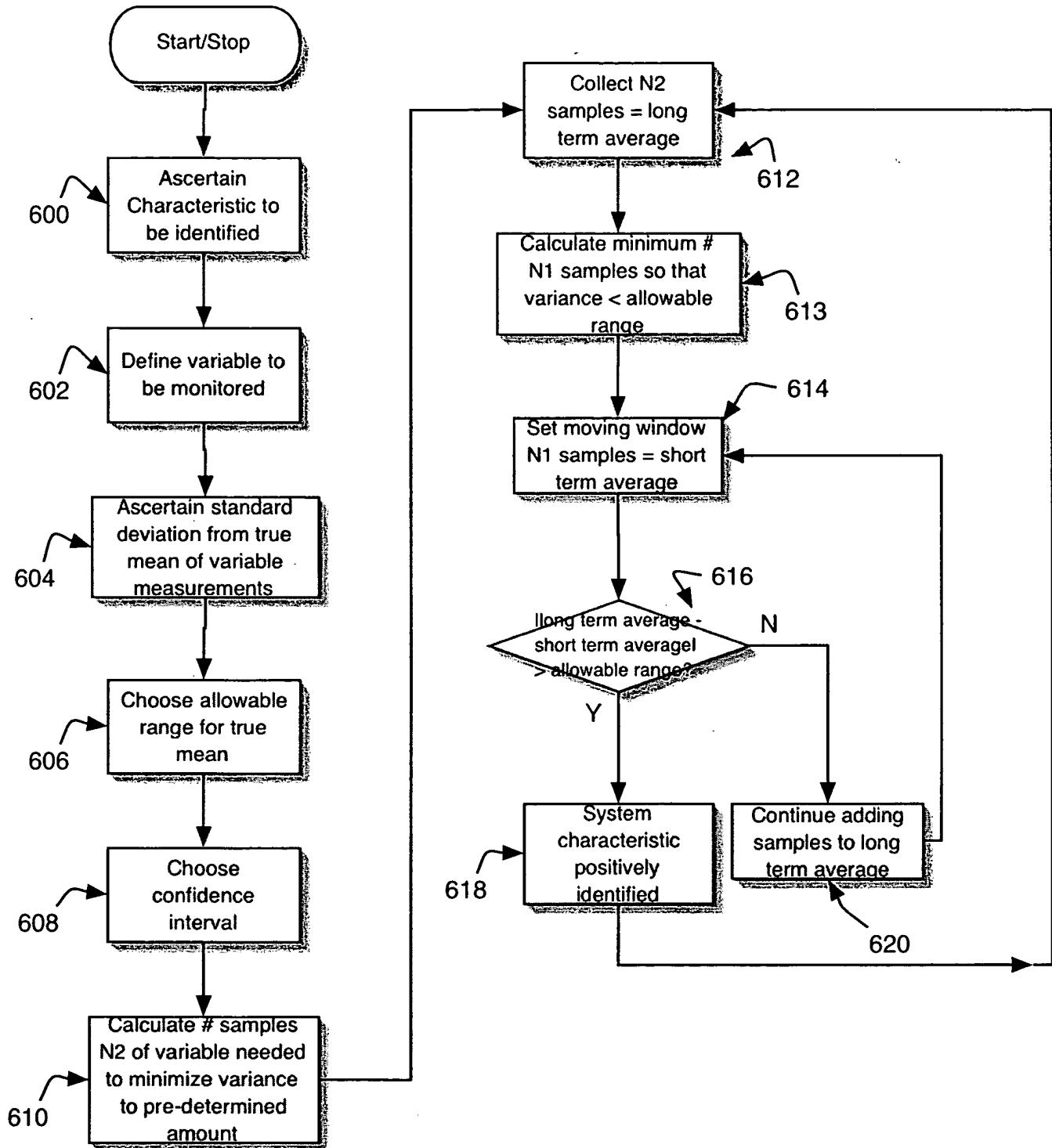


Fig. 55

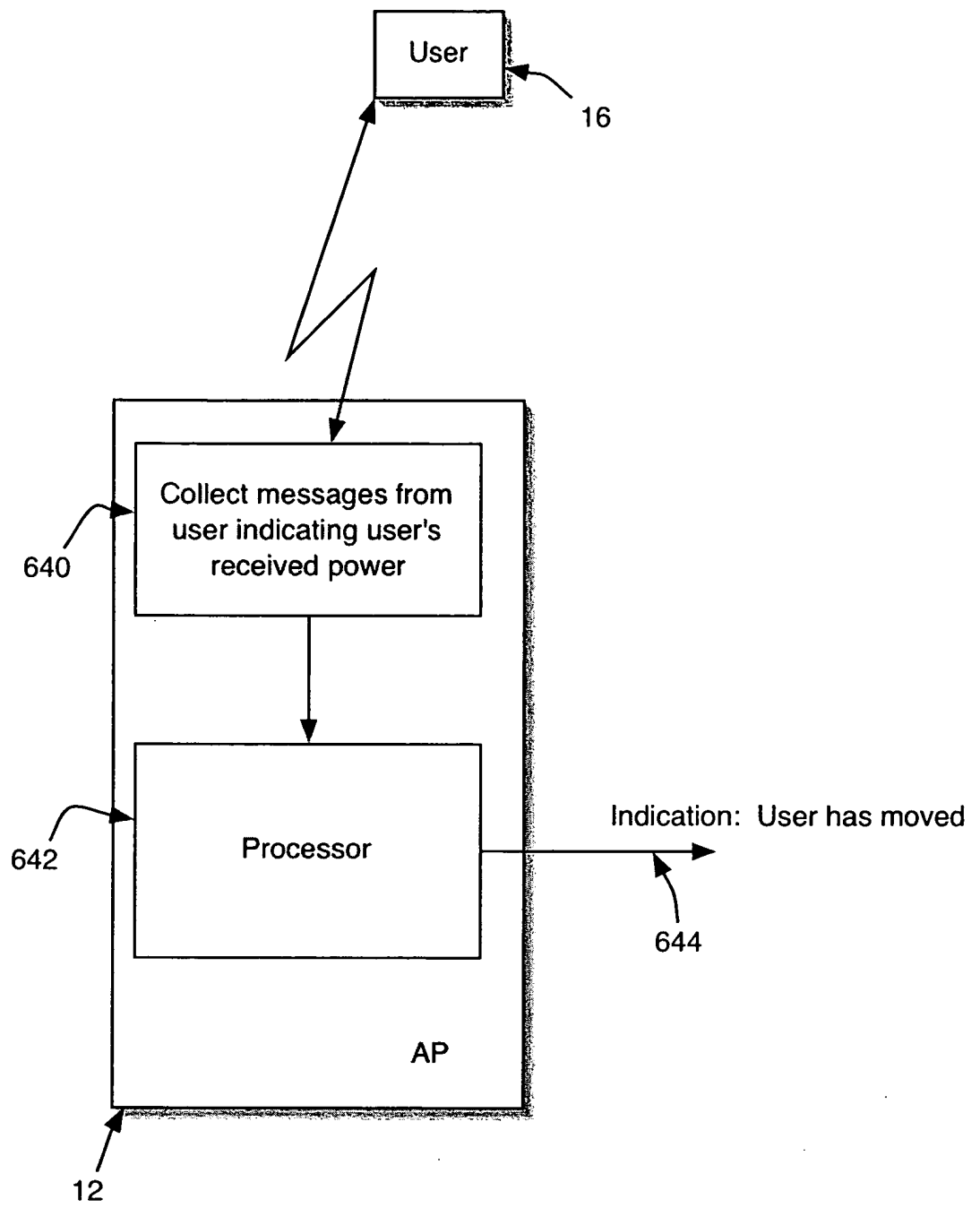


Fig. 56

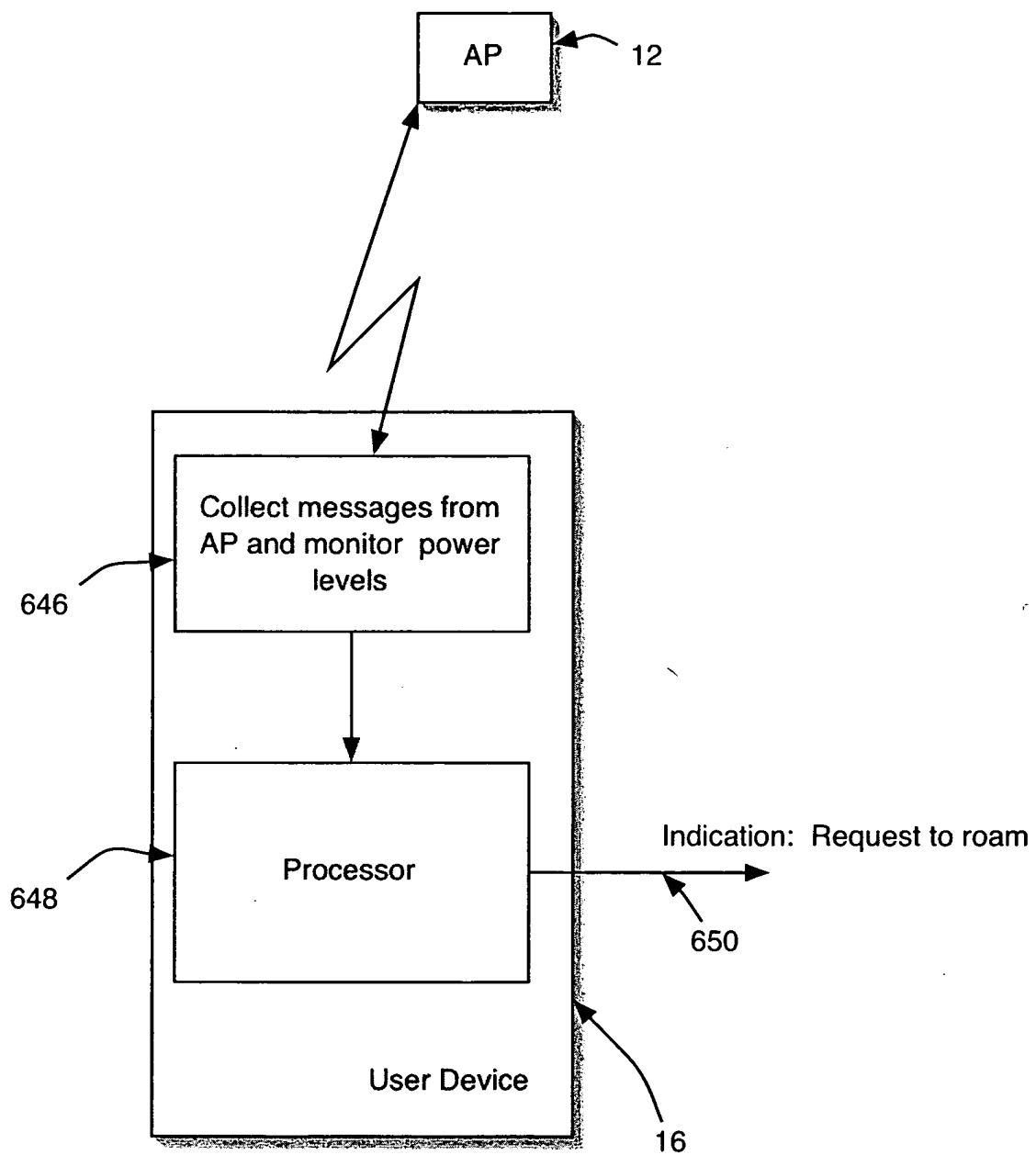


Fig. 57

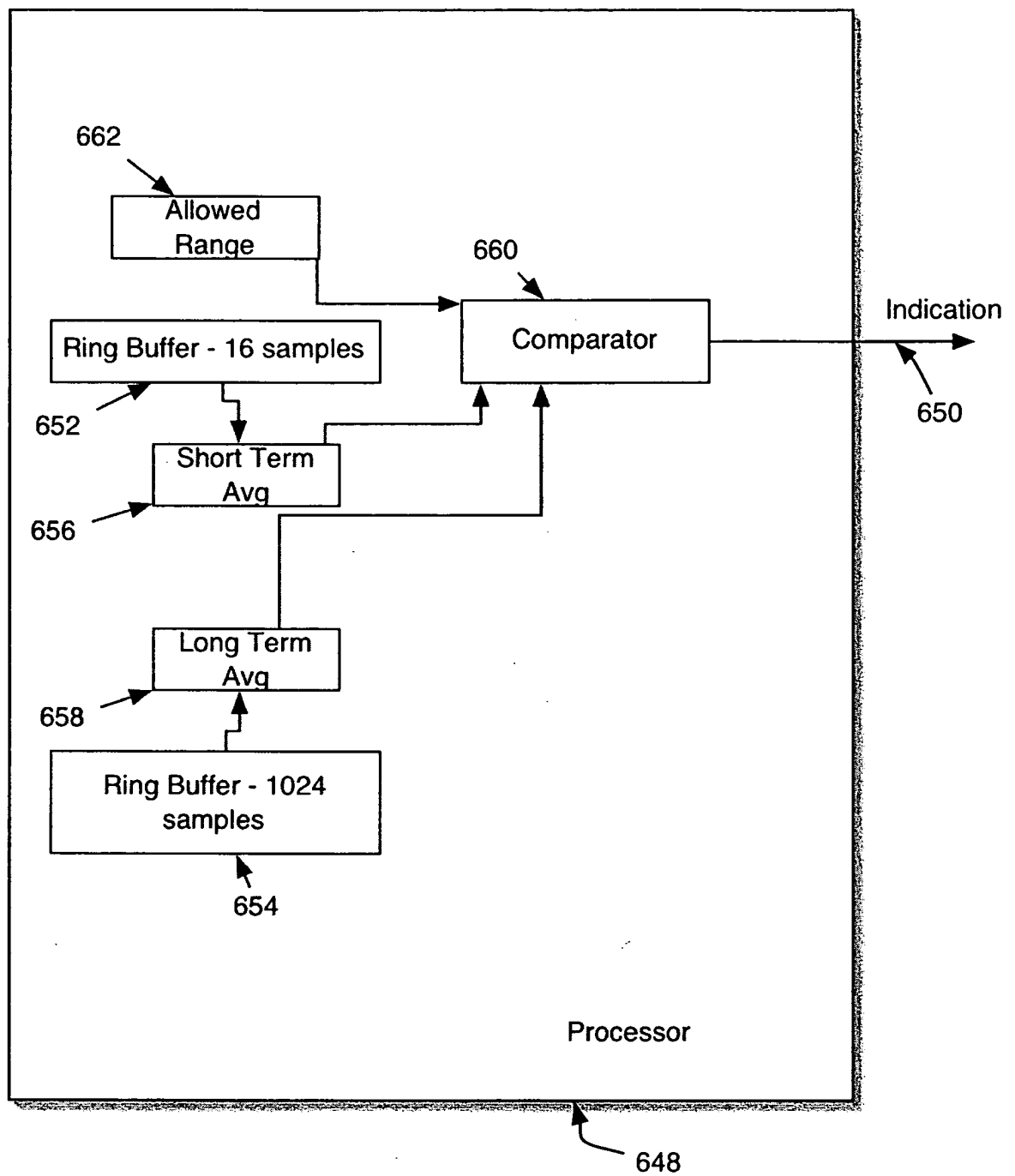


Fig. 58

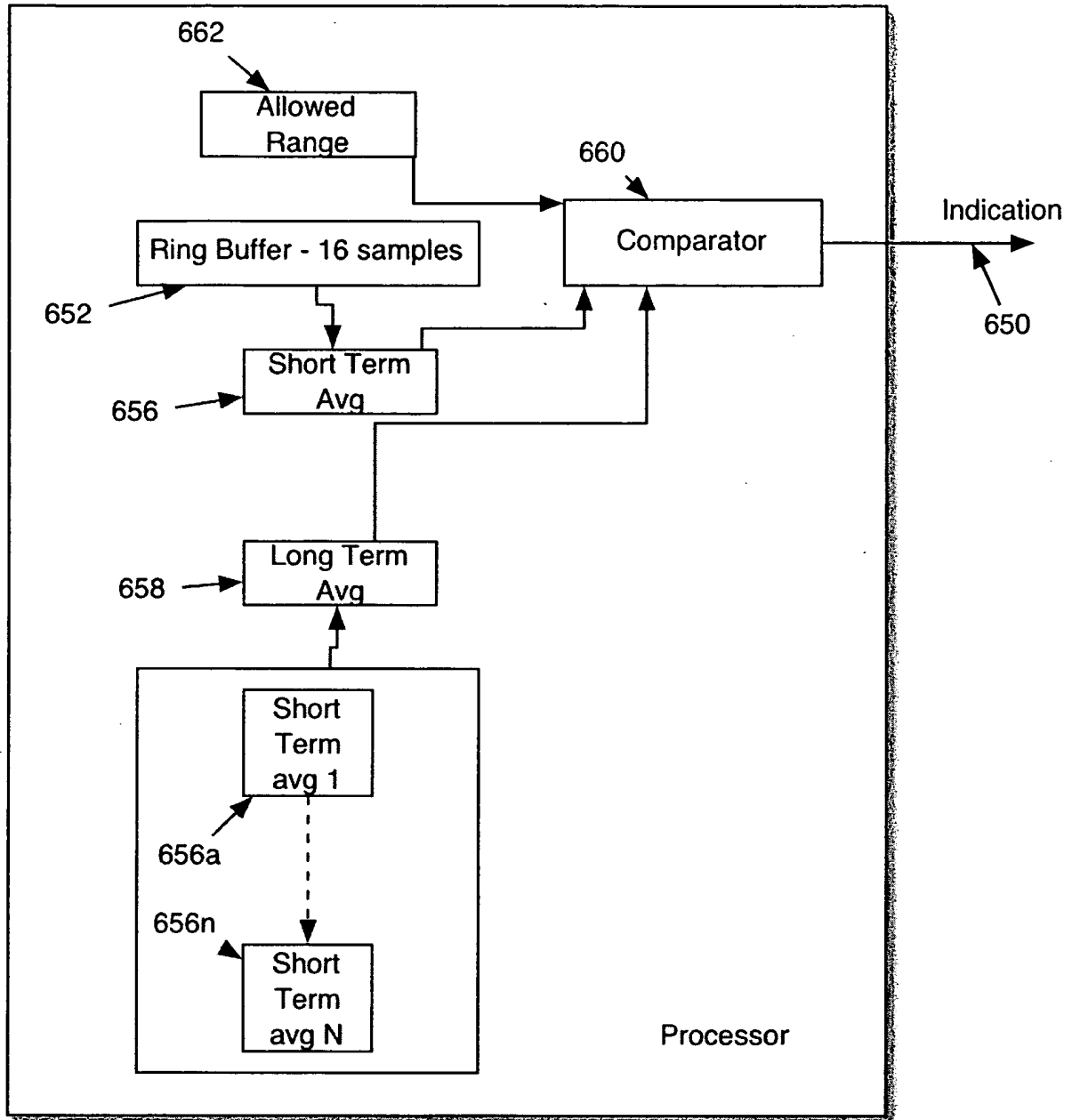


Fig. 59